PLANNING

THE ARCHITECT'S HANDBOOK

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PLANNING

THE ARCHITECT'S HANDBOOK

By E. and O.E.

With an Additional Section on Farm Buildings by EDWIN GUNN, A.R.I.B.A.

Illustrated with 600 Diagrams

Fifth Edition

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PREFACE

This new edition has been revised throughout, to bring it into line with post-war conditions. Much has happened since our last edition (1939); not only has the centre of interest and emphasis on planning changed but, by force of circumstances, priority is now concentrated mainly on essentials—housing, schools and factories. We make, however, no apology for including many of our pre-war headings, for example, museums, art galleries, libraries, crematoria; such buildings will be required in the future and preparation for them, whether in the form of individual sketch-plans or within the wider view of complete town-plans, must continue and will, eventually, lead to a change in emphasis on particular priorities.

New sections have been added and others entirely rewritten—housing, community centres, schools, public houses and so on; the section on farm buildings has been likewise brought up-to-date, to fit in with the new outlook on agriculture, by its original author, Mr. Edwin Gunn; his willingness and hard work in collaboration we wish to acknowledge with many thanks.

We cannot emphasise too strongly that this book is designed as a reference book to assist those who have to design and plan buildings; it is not a treatise on the fundamental theory, the academic or the basic principles of planning. The attempt is here made to give the essentials of plans and an outline of more important details which must inevitably affect planning, to make it efficient, straightforward and pleasant for the user. The ultimate achievement in a building of architecture, in its fullest expression, must always rest with the individual designer.

We acknowledge our indebtedness to many published and other references used in the course of our work; to give a list of the names and sources would occupy more space than we have at our disposal. We would, however, thank all those who individually, through Government departments, or through other organised bodies, have assisted us to check or compare information and data of all kinds.

We realise that our choice of *nom de plume* may be regarded as designedly adopted to disarm criticism of errors or omissions in our book; we would ask, however, that where they may be found, our attention shall be drawn to them, together with any suggestions to effect the improvement of future editions, when the latter are called for and are made possible by increased supplies of paper.

E. & O.E.

London: September, 1947.

ABBREVIATIONS USED

(As recommended by the British Standards Institution)

B.S.	British Standard
cu. ft.	cubic foot *or* cubic feet
cu. yd.	cubic yard *or* cubic yards
cwt	hundredweight
ft	foot *or* feet
in	inch *or* inches
f.c.	foot candle *or* foot candles
lb	pound (weight) *or* pounds
W.C.	water closet
sq. ft.	square foot *or* square feet
gal	gallon *or* gallons

1. *Housing*

Definition—The authors find that the word "housing" has received widely differing interpretations and therefore for the purpose of this section they have defined the term to mean: Houses or flats built, primarily for letting, by local authorities, housing trusts and societies or by private enterprise, intended for occupation by those with incomes generally not exceeding £400 per annum and having floor areas not exceeding 1,200 superficial feet measured within the external walls for houses and 1,000 superficial feet for flats.

Introduction—While in the definition reference is made to dwellings primarily for letting it is appreciated that the types of dwelling are basicly the same for a large proportion of the houses sold through long-term mortgages with building societies and similar agencies and which cater for the demands over the upper limits referred to above; and it is also realised that the figures given are quite arbitrary and may vary over a period of years.

An important consideration which has to be borne in mind in the planning of "housing" as opposed to "houses" is that the tenant or occupier is individually unknown and, therefore, the planning must be concerned with providing the best possible solution for the probable needs of an average family in the particular area in which the dwellings are to be built. A further and more difficult factor is the need to anticipate as accurately as possible future trends, since many of the houses may be financed by long-term loans, the periods of which may be as long as sixty years in order that the rents may not be unduly high. In passing, it is as well to remind readers that in order to meet the needs of the lowest income groups houses are often let at uneconomic rents even assuming the very lowest return on capital expenditure. Cost is undoubtedly a factor which is always before the designer of housing in order that rents or selling prices are not unduly high; to this must be added the need to design, construct and equip housing in such a manner that maintenance costs are kept to a minimum, a factor which reacts not only on rents but also makes for general convenience and the elimination of much annoyance to tenants.

The problems of housing are divided into certain essential categories of building, such as houses in urban and in rural districts for which the planning considerations should be quite different, flats, maisonettes and finally houses for specialised tenants such as miners, rural policemen, small-holders, and old persons.

Legislation and Publications—There has been much legislation covering the field of housing to which additions seem likely in the near future. Local authorities were empowered to provide houses in 1851, but few used these powers until after 1919. The standards of housing have been set out by the Ministry of Health from time to time by legislation such as the Overcrowding Act of 1935 and by means of Housing Manuals and Reports and by official direction by Circulars.

Among the many official publications on this subject there have been a number to which it is desired to make special reference, as these have to be accepted as the official direction for these types of dwellings. The earliest of these documents which remains of importance is the Tudor Walters Report of 1918 on which the Manual of 1919 was prepared. A revised Housing Manual was issued in 1927 and was reprinted in 1934. In 1936, following the Overcrowding Act, Circular 1539 was issued by the Ministry of Health setting out desirable standards of accommodation. A Rural Housing Manual was issued in 1938. In 1944 the Department of Health for Scotland issued a Report, "Planning Our New Homes" (H.M.S.O., 3s.), which contains much information of importance, and this document was rapidly followed by the Ministry of Health publishing the Reports, "Design of Dwellings" (H.M.S.O., 1s.) and "Private Enterprising Housing" (H.M.S.O., 1s.), the latter dealing especially with the financial aspects of housing. "Design of Dwellings" led to the publication later (1944) by the Ministries of Health and Works of the "Housing Manual, 1944" (H.M.S.O., 2s.) and its "Technical Appendices" (H.M.S.O., 1s. 6d.). These last two documents must be considered to be the basis for the planning and equipment of housing to be erected under the aegis of local authorities in England and Wales and are likely to serve equally as references for much housing not directly under the jurisdiction of the local authorities.

General Problem—Housing has to provide shelter in the form of living and sleeping space, together with facilities for cooking and washing, both the occupants and their clothing, and services such as heating to insure at least minimum comfort, for individuals or groups varying in numbers from one person upwards. The Overcrowding Act of 1935 requires a minimum bedroom area of 70 sq. ft. for one person and 110 sq. ft. for two persons, and this in its turn led to the Housing Act of 1936, which bases the number of persons to be accommodated in any dwelling on the number of bedrooms provided. It should be noted that the accommodation is based on bedrooms, excluding all living rooms. Two children under ten years of age count as one adult. Thus a dwelling with two bedrooms accommodates four persons, three bedrooms five or six persons, depending on the size of the third bedroom, and four bedrooms seven persons, assuming that one room is small.

Figure 1 shows the percentage of families of various sizes in England and Wales, and Figure 2 indicates the sizes of the houses built between the two wars; from which it will be noted

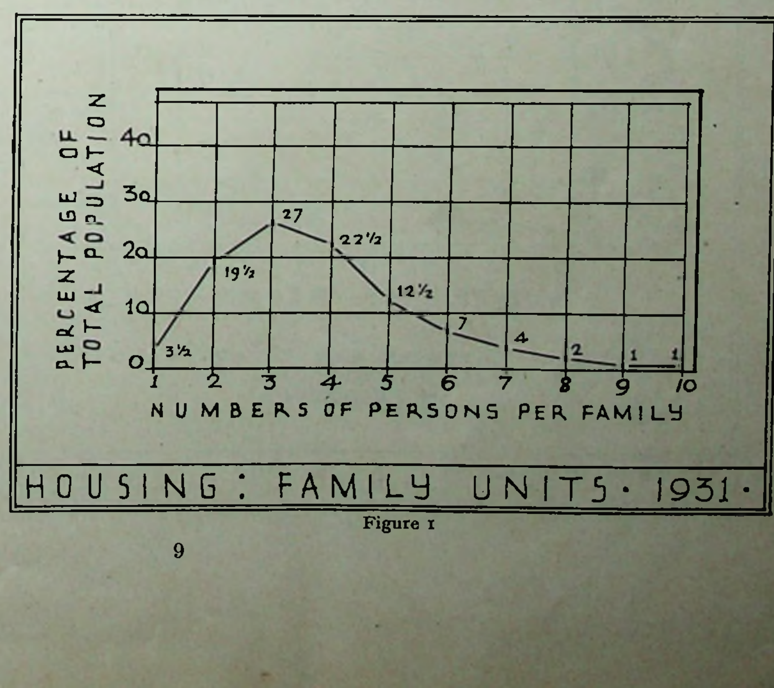


Figure 1

that houses with two bedrooms provide adequate accommodation for 50 per cent of the population, namely, those with three or less in a family. The average family in 1931 was 3.72 persons. In the inter-war years the greater proportion of the dwellings built in Scotland had two bedrooms, and in England and Wales three bedrooms, as is shown in Figure 2. The larger number of bedrooms built in England in relation to the actual family need was due to a variety of reasons and it is likely, for the same reasons, that this size of house will continue to be that most in demand and will best meet the needs of the bulk of the population.

There is a very definite need for smaller houses with one bedroom for old people and a proportion of single women and also small percentages for families with more than three children. It is probable that the majority of single persons are likely to be accommodated as lodgers, although there is doubtless a demand for small flats with communal feeding arrangements and for hostels.

Where two bedrooms only are provided it is desirable that each should be of such size that provision is made for two persons each. Where there are three bedrooms it is usual to assume that one may be for a single person only. If four bedrooms are provided, at least three should be double-size rooms. Children under one year are usually discounted in assessing accommodation, but there is need for a suitable space for a cot in the main bedroom.

The reasons for providing three-bedroom houses when small houses would, on family numbers alone, be apparently adequate, are :

Firstly, to meet the possibility of increases in family size, as occupiers naturally do not wish to keep changing houses as families increase. Secondly, in order to provide separate rooms for children of each sex as they grow older. The third room also provides facilities for the accommodation of an aged parent or parents who cannot afford to maintain a separate dwelling, while a very usual and useful use of the room is to accommodate a lodger ; a large proportion of unmarried persons prefer to live with a family rather than being alone or residing in a hostel, even if such were available. A further reason frequently put forward to justify the additional bedroom, is for a visitor or visitors, especially members of the occupiers' family and to do so without extreme inconvenience to normal family life. Still another, but much less important, use of the room is to provide a storeroom or a workshop for hobbies which should, however, be met if possible in other ways, firstly by the provision of ample storage space in the house, and secondly by means of adequate garden sheds, or possibly by utility rooms which do not also have to serve as sculleries.

Even when two living rooms are provided in a dwelling it is undesirable that they should be taken into account as providing sleeping accommodation. The number of houses in which two living rooms are provided has varied very much in the past ; in Scotland the percentage has been negligible ; while in the Midlands and North of England it has varied in the large cities from as little as 10 per cent up to some 35 per cent, and in the South of England the figure is considerably higher in some areas. The provision of larger living room accommodation seems likely to increase. Reference to two living rooms in this respect is exclusive of sculleries or working kitchens, but not living-kitchens.

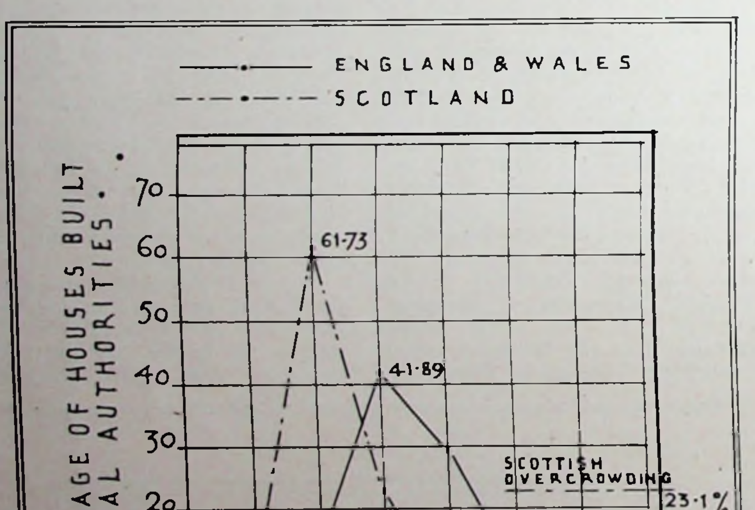


Figure 2

Floor Areas—There has been a gradual increase in floor areas of dwellings ; during the period immediately prior to the war the majority of three-bedroom houses ranged between 750 and 800 sq. ft. The 1923 Act called for a minimum for three-bedroom houses of 620 sq. ft. and a maximum of 950 sq. ft., a figure which was later reduced. The Ministry of Health Circular 1539 of 1936 set out the following areas :

- 3 Bedrooms-Non-parlour, 5 persons : 760 sq. ft.
- 3 Bedrooms-Non-parlour, 6 persons : 850 sq. ft.
- 4 Bedrooms-Non-parlour, 7 persons : 1,050 sq. ft.
- 4 Bedrooms-Parlour, 8 persons 1,130 sq. ft.

It seems that in the future three-bedroom houses will be about 950 sq. ft., and in some cases up to 1,050 sq. ft. with proportionate areas for houses with larger accommodation. It should be borne in mind that the increase in cost of a house is not directly related to the increase in floor area, as such features as chimney stacks and all the main internal equipment may remain constant.

There seems little doubt that the normal three-bedroom house has frequently been too small for comfortable family life, especially in regard to the working-kitchen and the lack of a second living-room or a space for meals so as to leave one room undisturbed by food preparation and service. A further reason is that no quiet facilities are possible for home-work or study, unless there are two living-rooms, or the bedrooms are of such a size and so heated that they may be used as bed-sitting rooms.

Figure 3 is an attempt to show in diagrammatic form the bedroom areas required in dwellings for various sizes of family, to which must be added the general living-rooms, bathrooms, W.C.s, staircases, corridors and general storage accommodation such as linen and boxes. These areas are based on the maximum floor areas recommended for bedrooms in the " Housing Manual, 1944 " ; 150 sq. ft. for main

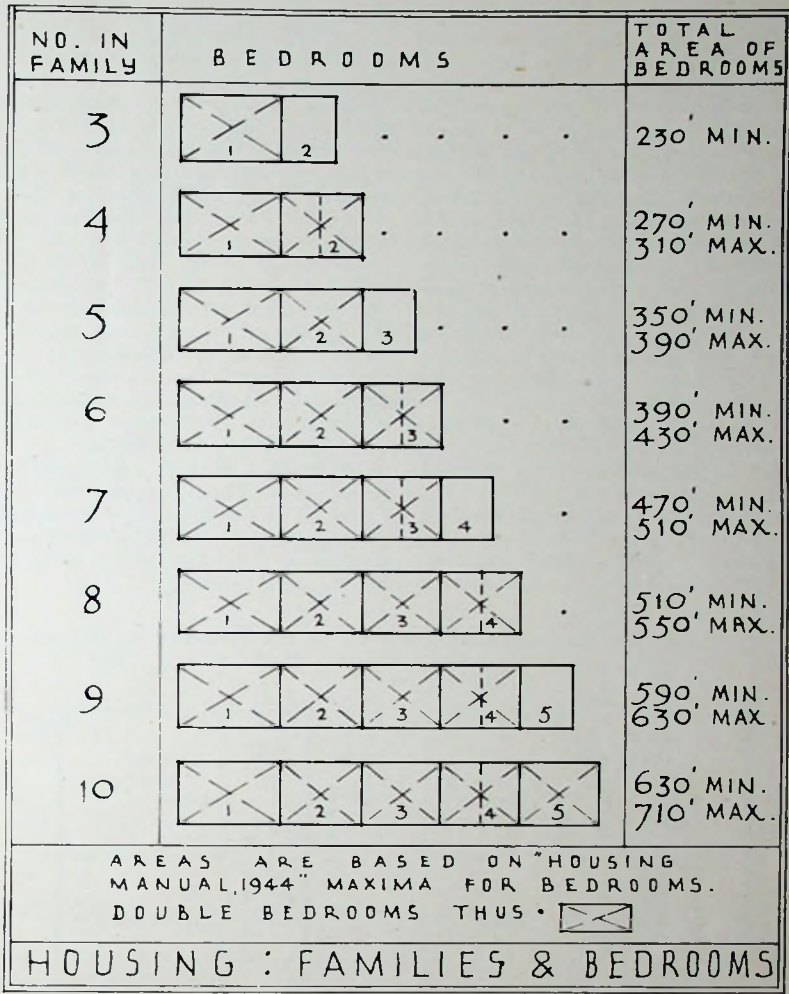


Figure 3

bedrooms, 120 sq. ft. for other double rooms, and 80 sq. ft. for single bedrooms. If these areas added to those referred to above are doubled an indication is given of the total floor area needed for the whole dwelling; it may, however, be necessary in houses for seven persons or more to plan one or more bedrooms on the ground floor to avoid excessive areas for the general living accommodation. It will be noted that in the types for four or more persons, excepting that for five persons, two figures are given dependent on whether the additional accommodation is in the form of a double room or two single rooms, the maximum figure for five persons is based on providing three single rooms and that for ten persons on the use of four single rooms, although these are very unusual developments. For those houses which have to accommodate large families it is most desirable that they should be of the parlour type, without which there can be very little privacy or comfort.

Use of Given Floor Areas—Given or assumed total floor areas may be subdivided in many different ways, but it will be found that in fact there are only four basic arrangements upon which a number of variations are possible; these basic arrangements are very fundamental as controlling the manner in which the occupants are able to use the accommodation and, in turn, in a broad manner, dictate the type and general arrangement of equipment and furnishing about which all houses must be designed.

The four basic types of plan arrangement for a given space are firstly, the working-kitchen, with separate dining and living rooms; secondly, the living-kitchen, with or without a scullery and with or without a second living-room; thirdly, the working-kitchen with dining recess forming part of one large living-room; and fourthly, the dining kitchen with a separate living-room.

Figure 4 illustrates diagrammatically these four basic types, together with one rather special variation of Types B and D shown in Diagram F which is needed to meet certain difficulties of aspect.

Diagram A is what has become known as the "universal plan" and has been widely used in private-enterprise house-building in the inter-war period. In this type the working kitchen is separate from both the dining and living rooms. When this type is used on narrow frontages the kitchen tends to be rather cramped and assumes that hardly any meals are to be taken in it; all meals, therefore, have to be carried, or served through a hatch, from the kitchen to the dining room; a method upon which opinions differ. On the one hand more work is involved, but on the other the housewife is able to eat in more pleasant surroundings away from the scene of actual cooking. This is a type essentially calling for two living rooms, and consequently a separate form of space heating is needed in both rooms. This type also necessitates heating in some form in both kitchen and dining room in addition to the living room, since both rooms are used at intervals throughout the day. Back-to-back grates providing a cooker on the kitchen side and a fire on the dining room side have been installed in this type, but such equipment places the dining room fire very badly in relation to the use of the room. This arrangement does provide, however, a complete separation of the main rooms of the ground floor.

Diagram B may be either a two living room type or the whole of the living space may be in one large living room. The essential factor in this type is that the main cooking is carried out in the living-kitchen and therefore one fire can serve the two purposes of cooking and space-heating and often water-heating as well. The kitchen-living room type was probably the most-used form of layout in local authority housing in the past, since it was generally considered to be the most economical in operation and therefore best suited to houses for tenants in the lower-income range, especially when solid fuel is used for heating and cooking. Without a second living room the lack of privacy and the constant interruption of every other activity by cooking and meals is a great inconvenience. A combination grate was very often installed to try and overcome the lack of living room atmosphere. The continuous-burning insulated cooker has been recommended for rooms of this type, but it is likely that this also will lack the features desirable in a living room, especially if it is the only room for all family purposes. In this type the sink and laundry facilities are better if placed in a separate scullery directly approached from the kitchen-living room, and this can provide a space in which auxiliary cooking and water-heating apparatus may be placed for summer use to avoid the sacrifice of floor space in the main room.

In the type illustrated in Diagram C all meals are prepared in the working-kitchen and mostly eaten in a dining recess which forms part of the living room. A variation of this type is to separate the dining room and living room and thus form two rooms, although direct access from the hall to the dining room is not possible. This type is sometimes criticised on the ground that there can be only one

living room, and therefore there is no privacy or quiet. Recently a number of plans of this type have been seen, but in many cases good planning of the room and its furniture in relation to its functions has been sacrificed to obtain a single heat-unit serving all heating purposes, admittedly an economy but not if made at the expense of comfort. In this type the dining recess is usually small, with a consequent increase in the area of the working-kitchen ; this permits the better spacing and arrangement of equipment and better and larger working space for preparing meals ; the lack of which has been a defect of many houses built in the inter-war period.

Diagram D illustrates a dining-kitchen type, in which meals are taken usually at one end of the combined space, sometimes cut off by the arrangement of fixed equipment such as cupboards. By this means the living room is quite separate and consequently more suited to that part of family life not concerned with meals ; it requires, however, the provision of separate space-heating for each room ; this may be achieved by use of a back-to-back heater or a multi-purpose heat-unit. This type tends to make full use of the whole of the ground floor space, the second living room always tending to be used only for special occasions. A possible objection to the kitchen-dining recess type is that laundry has to be done in the meal room, but this may be overcome by the provision of a utility room or wash house ; in any case, whenever space permits it is desirable that laundry should not be done in the kitchen, a condition not always possible if rents have to be kept within the limits of the lowest incomes.

Diagram E is a typical three-bedroom layout equally applicable to all types of ground floor arrangements mentioned above. The relationship of bathroom, W.C. and linen storage will be discussed later.

All these types may be used as terrace, semi-detached or detached houses, as may also the type shown in Diagram F.

The type shown in Diagram F is based on the use of long frontages, and has a through living room which meets difficulties which arise from north aspects. The longer frontage permits of the staircase being planned on the front wall with direct lighting, even when the houses are used in terraces.

By the adoption of this type of plan the living room may have windows on the road frontage, and the kitchen is placed at the back, the only difficulty being the planning of a larder with a suitable aspect when the houses are in terraces.

General Planning Factors—Certain fundamental factors must be given very careful consideration in all housing plans ; these factors are aspect, daylighting, numbers of dwellings in

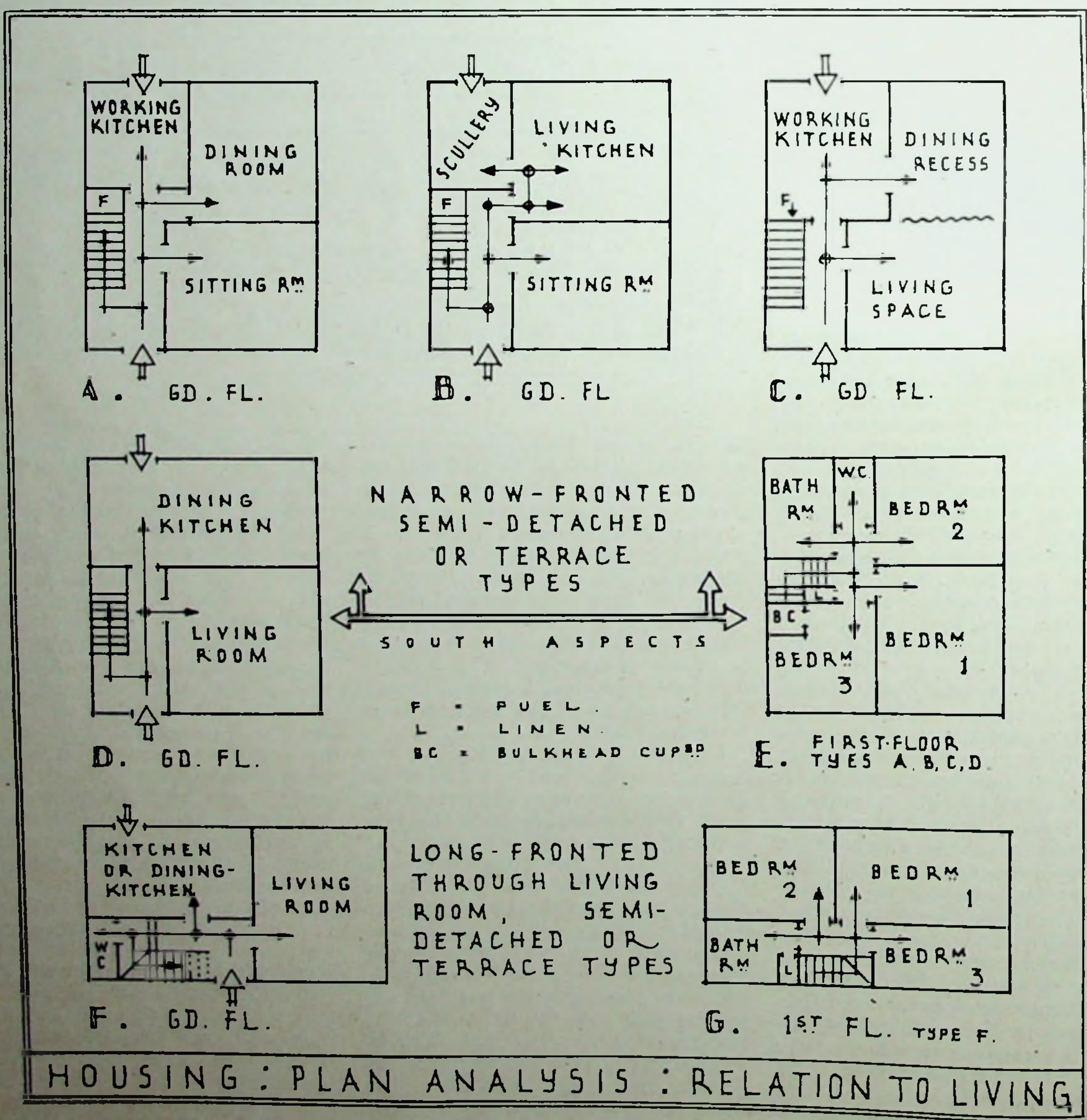


Figure 4

a block, general grouping, access and frontage lengths.

As already indicated it will be found also that the means or type of cooking and heating water have great influence on plans and to this must be added the effect of using large prefabricated components such as plumbing and heating units.

Plans should be designed to meet the functions of the several parts and round the main units of furniture needed in each room to insure the fullest comfort and amenity. Circulations between parts of the house or even within the walls of individual rooms must also receive full attention, and circulation spaces must be kept to the minimum consistent with good planning.

Aspect—There is general prejudice against plans which do not provide the kitchen and scullery at the back or side of the house, and the second living room, if provided, at the front and near the front entrance. It is by no means impossible to meet these desires and at the same time give reasonably good aspects to all the main rooms, but it is essential to change plan types to meet differences of situation in relation to the road access. It will be found that roads which are very directly east and west are the most difficult to handle, especially in regard to the houses on the south side of the road. Main living rooms should have sunshine for at least part of the day, whether they are designed to be used as living rooms only or as kitchen-living rooms. Sculleries and larders should have north or east aspect. In the design of large blocks of flats it is generally desirable to plan with the main axis of the block from north to south, so that sunshine reaches all rooms at some time during the day. Figure 5 is a diagram showing the hours during which sunshine is available for different aspects during the day at varying times of the year. The important factor is the low angle of the sun at noon in mid-winter, as this influences the spacing between buildings or blocks of buildings. Indicated on the perimeter of the diagram are also recommended aspects for different types of room. It is important that kitchen-living rooms should be treated basically as living rooms and not as kitchens, although full south-westerly aspects may prove to be somewhat hot in summer-time.

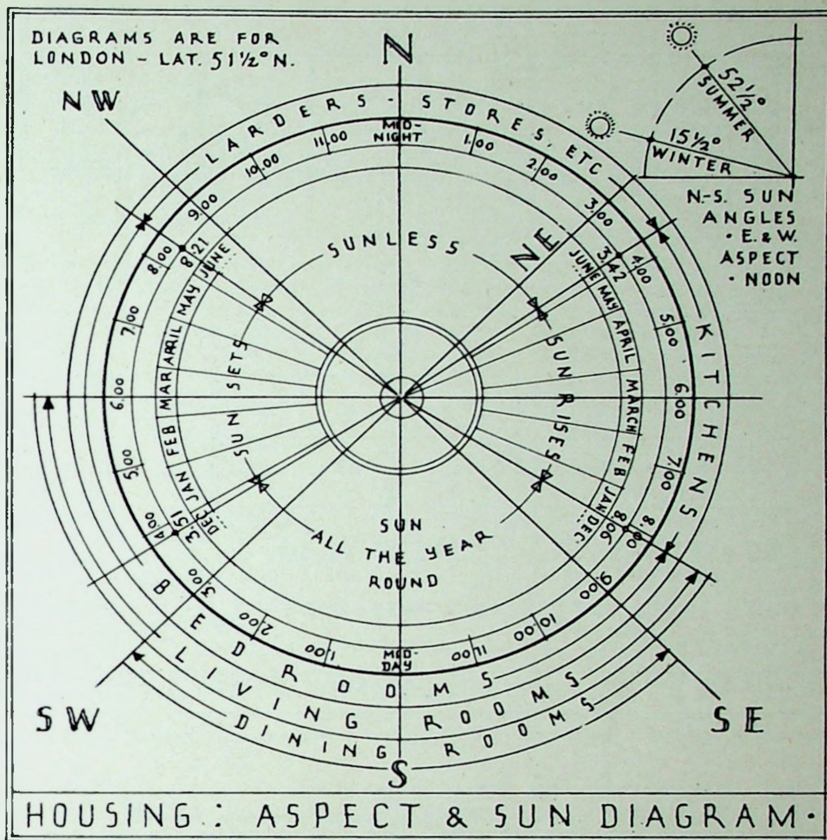


Figure 5

FRONTAGES OF RECTANGULAR PLOTS OF DIFFERENT DEPTHS

Houses per acre	Depth of plots in feet							
	100	120	125	130	135	140	145	150
6 ...	72·6	60·5	58·08	55·83	53·6	51·83	50	48·4
8 ...	54·43	45·37	43·56	41·875	40·25	38·875	37·5	36·3
10 ...	43·56	36·3	34·84	33·5	32·2	31·1	30	29·04
12 ...	36·3	30·25	29·07	27 91	26·83	25·91	25	24·2
15 ...	29·04	24·2	23·23	22·3	21·46	20·73	20	19·36
20 ...	21·78	18·15	17·42	16·65	16·1	15·55	15	14·52

Figure 6

Daylighting—The important consideration in the provision of adequate daylighting is not only the size of windows, which are at the moment regulated by by-laws, but also site planning, with such spacing apart of rows of houses or blocks of flats to insure that sunshine is not cut off in the winter-time. Reference should be made to the Report entitled " Lighting of Buildings " (M.o.W., Post-War Building Studies, No. 12, H.M.S.O., price 2s. 6d.), in which the whole problem is thoroughly discussed and very full recommendations made, although in some respects these may be considered a little idealistic in regard to the spacing of buildings in urban areas. The sizes and types of windows will be discussed later in greater detail.

The greatest problem in daylighting affecting the planning of individual houses is that of the terrace house, where two sides only obtain light ; it is therefore most desirable that frontages should not be too short, since longer frontages mean reduction of depth in rooms. The most troublesome lighting matter in terrace houses is the staircase, which has to receive its light from the front hall wall on the ground floor and from fanlights over doors on the upper floor ; this difficulty does not arise in semi-detached houses, where the staircase may be on an outside wall, or in long-fronted types.

Site Dimensions—The number of houses to the acre may be defined by the development plan of the area under the Town and Country Planning Acts, and usually have to be interpreted into plot sizes by the architect when considering whether detached or blocks of houses are to be used. The table in Figure 6 gives the depth of each plot, together with the frontage provided for various numbers of houses per acre. It should be borne in mind that half the width of roads up to a maximum of 20 ft may be included for the purpose of calculating acreage, site cover and the number of dwellings.

It should be realised that narrow frontage layout, although more economical in length of roads, paths and main services, is not necessarily the most economic development of every site, since deep sites may be wasteful

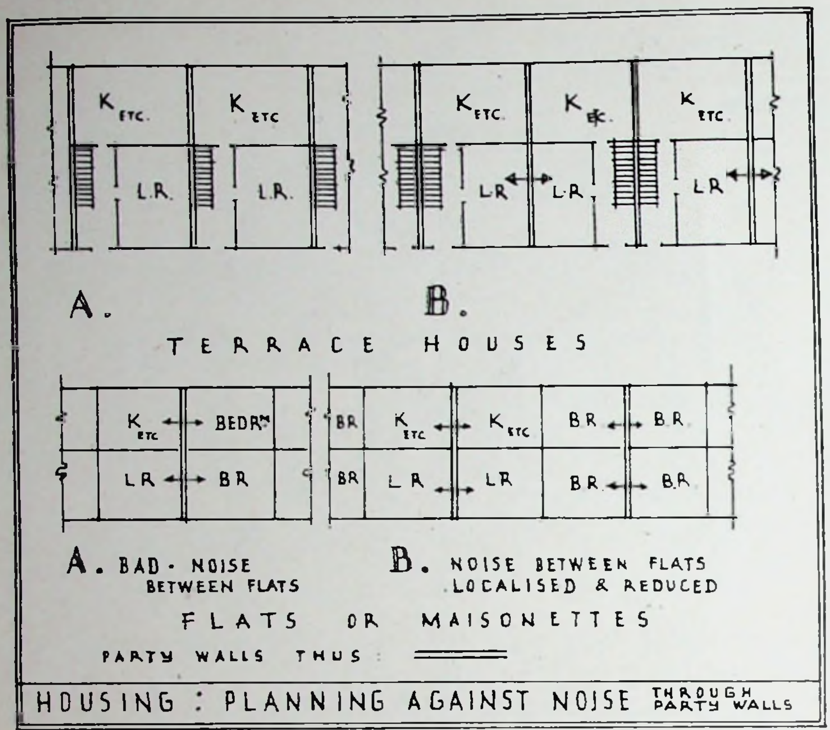


Figure 7

of land. It is desirable that sizes of garden vary throughout a housing scheme, as some tenants prefer small gardens and others large gardens. Some allotments should be available reasonably near all houses for keen gardeners and also for the use of tenants of flats.

Grouping—Houses may be built singly, in pairs, and in blocks of four to as many as ten or even more in terraces. There seems no doubt that detached houses are the most popular due to the increase in privacy provided, but the cost is greater due to increased lengths of roads, sewers and services, and to the increased amount of external wall. Detached houses have advantages to the planner, since all external walls are available for windows and access to the back door may also be on any of three walls or even on the main frontage.

Not only is privacy increased in detached houses, but noise is reduced, especially between adjoining houses, although effective steps can now be taken with constructional developments to reduce sound penetration between semi-detached or terrace houses, and assistance may be gained by avoiding the planning of living rooms adjoining one another. Figure 7 illustrates in Diagram A how in terrace houses the staircase and hall may be used to act as a cut-off buffer between living rooms, whereas in Diagram B the plan shows the main living rooms separated only by the party wall, which even if of special construction, will only partially control the passage of sound between two dwellings, unless exceptionally costly construction is indulged in. It is important in the planning of flats to avoid placing the living room of one flat adjoining bedrooms of another ; maisonettes are similar to houses, having living rooms and bedrooms on different floor levels, and may therefore be easier to plan with protection from noise than is the case with flats. The objection to adopting the planning shown in Diagram A is the multiplicity of chimney-stacks which may arise if every room is to have a flue suitable of solid fuel. It has been said that blocks should not be longer than ten houses, but it is difficult to appreciate any reasons for this statement, as lengths are more dependent on street planning and the provision of good grouping to suit individual sites. The reduction of external wall in houses built in terraces or large blocks saves in general cost and in heating.

Rural housing, where land is less costly and larger gardens are desirable and generally preferred, may be more widely spaced, and it is consequently doubtful that blocks greater than four houses are desirable ; in fact, semi-detached and detached houses are to be preferred. It will be found that blocks of four houses, and certainly larger blocks, present special difficulties in rural areas, since much larger outbuildings are necessary, and these are difficult to plan for the intermediate houses of rows, though easy for the end houses. A satisfactory method of grouping rural houses to overcome the difficulty of the large outbuildings is to plan semi-detached units with two sets of outbuildings placed between them, and the whole linked together with walls ; this solution overcomes many of the aesthetic objections to semi-detached houses, prevents views of untidy back yards being seen between the houses, and also avoids the necessity of placing outbuildings so that the view is blocked from the ground floor windows of the back of the house.

It is most desirable that housing estates should have houses of various sizes mixed together, and not forgetting the need for houses for special occupancy, as, for example, doctors and ministers of religion ; any plan should encourage the idea of community living as far as possible. Special provision should be made for old people either in the form of bungalows or in two-storey flats, with staircases leading to balcony approaches for the upper level ; old people should always be housed near young relations, so that they are not cut off from easy visits ; such housing should, if possible, be given sites near to means of transport and also fairly near to shops.

Flats and houses should be mixed together in all developments, as there are always those who prefer to live in a flat, even in villages or in rural areas.

Bungalows are also quite popular and, where land is cheap, as in rural areas and where larger sites are possible, this form of development should be given consideration.

Access—Direct front access is needed to all houses and blocks of flats, but it is equally, if not more, important to provide proper access to " back " doors to all houses. It is not, however, usual to provide the second or service access to low-rental flats. Access must be such that vehicles may deliver, and refuse collection be made, with the minimum of inconvenience and loss of time. The back door is the one most used by members of the family in the lower rental types of housing. Access must be easy to the fuel store and for removal of refuse, which necessitates paths from the fronts of the houses to the rear, or alternatively back-service roadways. The former is the better solution, although in terraces or groups of houses of more units than two (semi-detached), passageways through the block must be planned for every pair of houses, to avoid passing through gardens of other houses ; back-service roads or paths necessitate the carrying of all deliveries the length of the gardens and is a method more costly in road construction, as such service ways should be sufficiently strong to carry vehicles, and of widths sufficient for two vehicles to pass, or alternatively to have frequent passing bays. Passageways through blocks, however, tend to be noisy and to lack privacy. Back doors should not be placed so as to open into these passageways.

Figure 8 illustrates three methods of providing back access to houses in blocks or terraces. Diagram A illustrates normal through-passageways between pairs of houses over which the first floor is generally carried ; these

passageways should not be less than 3 ft 6 in wide, and preferably slightly more and should be as high as the first floor level will permit. Once through the passageway there should be separation of the approaches to each back door served ; it is also desirable that the back doors should be planned near the passage to avoid having to pass ground floor windows. The passageways should be paved and carefully drained to remove rainwater rapidly to gullies placed in front and behind the buildings. Gates should be provided at the entrance to each back garden.

Diagram B illustrates an alternative method of back access by means of service paths or roadways. These should not be less than 3 ft 6 in wide, but are very much better if wide enough for vehicular traffic and when this is not possible, 4 or 5 ft should be provided for convenience of milk barrows and similar small delivery carts. These paths or roadways should be in straight lines and, if possible, from road to road to facilitate police supervision. As already stated, the distances to be covered by tradesmen cause great delay in deliveries and in the cases of coal and refuse removal involve carrying heavy loads for long distances, which are obviated by the use of the type in Diagram A.

Diagram C illustrates another method of providing back access in terraces or long blocks by the formation of yards, preferably behind screen walls which give access to kitchens, fuel stores and dustbins. Such a system can only be used where there are long frontages. A possible objection is that the yards are enclosed and may be used to accumulate rubbish ; but it is likely to give a tidy appearance to an estate and avoids the draughty passages of Type A.

Access to Flats—This subject falls into two categories ; firstly, blocks of not more than three stories or four stories, if the upper two are in the form of maisonettes ; and, secondly, blocks of more than three or four stories ; staircases may be considered adequate vertical access for the first type, but lifts are essential for those in the second type. In all higher blocks, the balcony form of access is likely to be the most economic, although there are definitely disadvantages, chief of which is the need to pass the windows of some flats to reach the entrances of others. It is very important that at the lower end of staircases access is possible both to the front and back of the block ; the front entrance is for entry to the block and the back entry to reach pram stores, outside fuel stores and refuse bins.

It is essential that back access for vehicles is provided to bring heavy deliveries such as fuel as near the blocks as possible and similarly for refuse collection.

Direct entrance from staircases gives more privacy and is preferable to access from balconies, but the cost is generally prohibitive except for blocks of three stories or less ; in high blocks where lifts become essential the cost of lifts and their operation necessitates the use of balcony access. Goods lifts are desirable even when passenger lifts are not provided. Details of the planning of balconies, lifts and staircases are given in the section on " Flats."

Placing of Chimney Stacks—It may reasonably be assumed that solid fuel, preferably in smokeless form, will be used in all living rooms and in many kitchens, therefore provision of flues for this purpose will have to be made. It is also desirable that similar provision should be made in second living rooms or parlours, when provided ; although in the latter gas or electric heaters may be preferred, it is probable that most tenants still prefer the possibility of using solid fuel when they wish and other fuels only as a secondary means of heating.

Flues may be planned either on the external or party walls, or in a central position often on a spine wall. In the past the party wall or external position has been the most usual and is believed by many to be the most economic. There is, however, an indication that changes in the types of appliances to be used, especially heating units incorporating combined heating for several rooms, including some trunked air-heating, may tend towards a greater use of the central position. Such positions have great bearing not only on the type of appliance but also on room planning to avoid bad placing of the heating appliance in relation to its full use by the occupants and in relation to furniture lay-out.

Figure 9 illustrates six typical layout plans and stack positions. When considering this aspect of planning it should be borne in mind that few tenants now require solid fuel fires in upper floor rooms and prefer gas or electricity since these mean less work in cleaning and carrying fuel and quick heating is also available ; while the theory that a solid fuel fire is needed in case of illness is largely exploded on health grounds so long as adequate and correctly designed ventilation is provided by means of constant flow ventilators and flues.

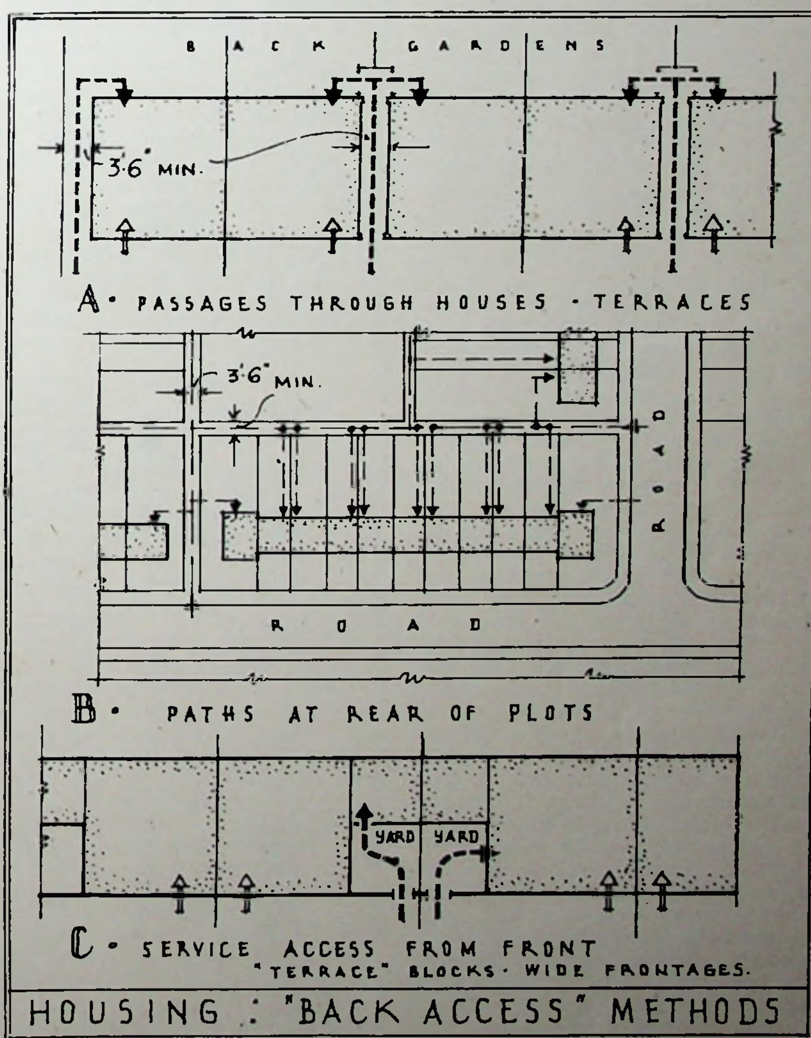


Figure 8

In Diagram A separate stacks are planned in both rooms, but may often be gathered into one stack within the roof space. In this type the fires are well placed in relation to the use of the rooms, but a long pipe run for hot water may be involved if the linen, bath and sink are at the staircase end of the plan. The possible difficulty of this type may be overcome by the adoption of the lay-out shown in Diagram B and the stack in the dining-kitchen used for the purpose of hot-water heating.

If the lay-out shown in Diagram C is used either for this or the separate dining room type, it is again desirable that the appliance for water heating is placed in the working-kitchen ; in many plans, however, the living room or dining room fire heats water by means of an open fire or stove back boiler, an arrangement which frequently involves long and unsightly pipe runs and considerable heat losses. The fires in this diagram are, however, well placed in relation to the use of the rooms and allow a comfortable arrangement of furniture.

The type shown in Diagram A1 permits of the use of a heating unit for multiple purpose or a back-to-back grate with consequent economy, but the living room fire is badly placed for full use, as the occupants have their backs to the light, and the space is in the darkest part of the room—a point which applies particularly to deep narrow-fronted plans.

Type B1 is again fairly economic from the point of view of appliances and stack, but the position of the hall door makes one side of the fire-place almost unusable.

Type C1 is likely to prove very unsatisfactory, as the stack is planned on the short wall, and any person seated on the right of the fire will be in a draught and is also in the way of access to and from the dining recess. It has been said that with the installation of adequate background heating by means of continuous-burning heaters, the rooms will be so heated that draughts will be eliminated, and so a plan such as this is made possible for comfort ; but it would seem that this is only true on the assumption that windows are airtight and never opened, also that doors are draughtproof, which is a degree of perfection not yet reached in house-building technique.

It is, therefore, of the utmost importance to consider very carefully the layout of furniture and the method of using a room in deciding the placing of fuel appliances. A further factor that must be weighed fully is the extent to which flues are needed ; as the occupants and their preferences are unknown at the time of planning it is probably necessary to make provision for solid fuel, gas and electricity in all the positions that fuel appliances may be installed, although this involves considerable capital expense, and some of these services may never be required by individual tenants. As already stated, solid fuel may probably be omitted on upper floors.

A development which, if proved to be satisfactory in operation, will have to be considered very carefully in relation to general internal planning, is the use of air ducts from the main heating appliance conveying heated air to other rooms either on the same or upper floors ; such a combined appliance necessitates the use of plans of the types shown in the lower half of Diagram 9, unless very long ducts are to be used and are exposed on the surface of walls or ceilings. With such appliances not only has the designer to relate the ground floor plan to the appliance, but also the room arrangement of the upper floor, which may well limit house or flat plans to very standard types.

Placing of Bathrooms—The position of the bathroom has considerable effect on the general planning of small dwellings. In urban areas, except in certain special cases, determined by occupational requirements, this room is preferred on the upper floor, but in houses in many rural districts there are advantages in providing a ground floor position. It will also be found that in some types of plan, especially those with kitchen-living rooms, there is insufficient accommodation on the ground floor area to provide minimum bedroom areas above unless the ground floor rooms are made unduly large ; in such instances the ground floor bathroom may be found suitable.

Any increase in the number of bedrooms over three does not need a proportionate increase in ground floor area, although some increase is desirable, and consequently one of three alternatives may be adopted : firstly, to put the bathroom on the ground floor ; secondly, to plan one or more bedrooms on the ground floor ; or thirdly, to form a second floor by an extra storey, or by planning rooms in the roof-space when pitched roofs are adopted.

W.C.s—It is now recommended that two W.C.s should be provided in houses having three or more bedrooms ; this would seem only really necessary, however, in three-bedroom houses if fully occupied by five persons. The second W.C. is likely to have considerable influence on the planning of houses. It is suggested that where two W.C.s are provided, one should be placed in the bathroom on the first floor and the other on the ground floor ; thus to plan the bathroom on the ground floor, as may be necessary in some schemes for the reasons given above, the logical corrollary would be to plan the second W.C. on the upper floor, but this may prove as difficult as for a bathroom. It is desirable that the second W.C. is planned within the building, but this may also be somewhat difficult in terraces or blocks of houses, and an outside position may have to be used, with risks of freezing in winter unless cost-adding precautions are taken. It is suggested by medical authorities that a lavatory basin should be installed in every W.C., which increases the space required and may prove difficult to plan in conjunction with the hot-water service. On long-frontage terrace houses it is easier to provide an inside ground floor W.C. approached

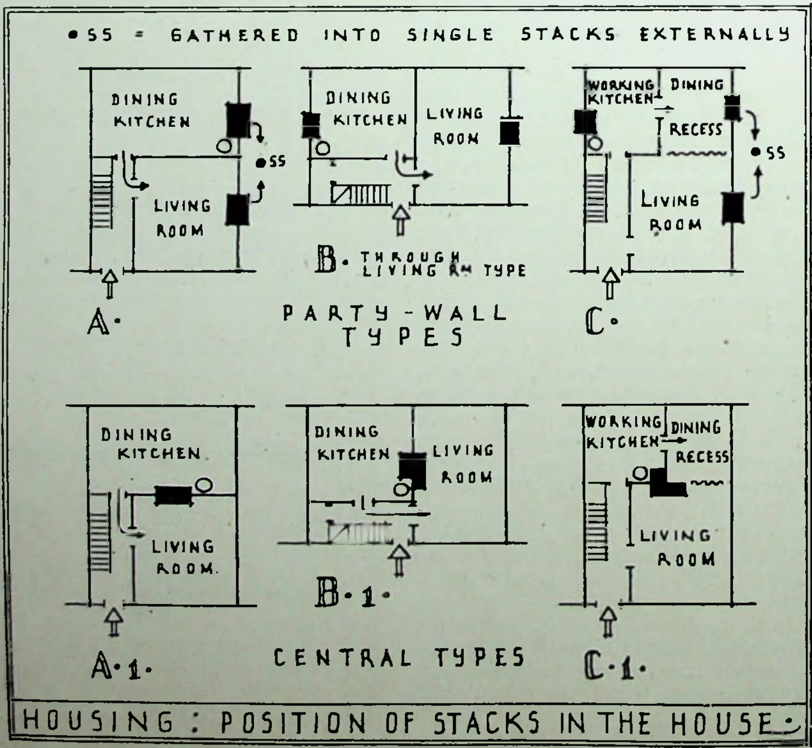


Figure 9

from the entrance hall ; the use of end external walls of pairs or single houses also facilitates a solution of the problem.

Entrances—It is desirable that steps at entrances be as few in number as possible ; they are inconvenient when prams have to be taken into the house, and for old people. The paved area in front of any steps should not be less than 3 ft wide. Protection of the front door is desirable either by means of a hood or porch, especially on exposed sites ; a porch is considered almost essential in rural and coastal districts. Two doors at entrances are the only effective means by which strong winds and draughts may be excluded from the house. Main entrance doors should not be less than 2 ft 9 in wide to permit satisfactory handling of furniture or prams. A letter plate should be provided at all main entrances. Entrance doors should never open directly into living rooms. Doors should be provided either with a slightly-raised sill, a mat

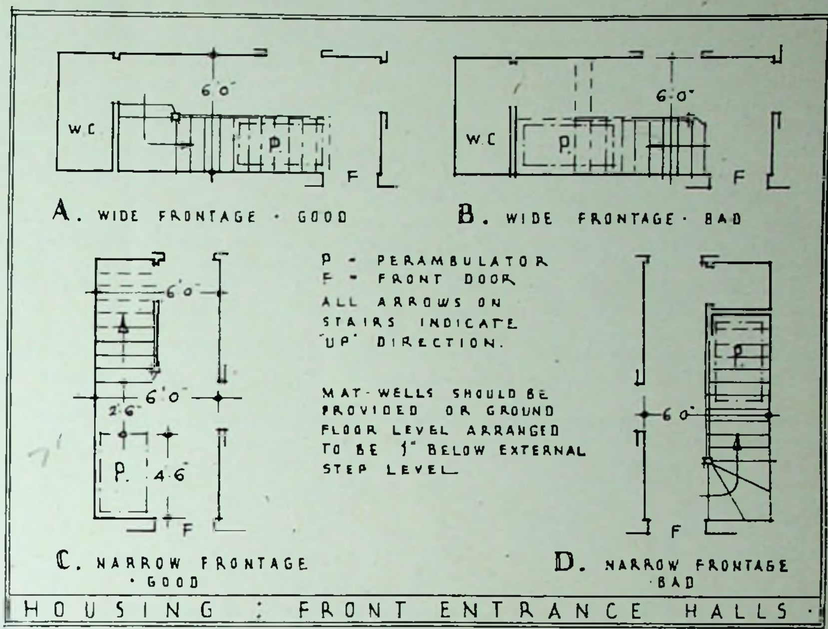


Figure 10

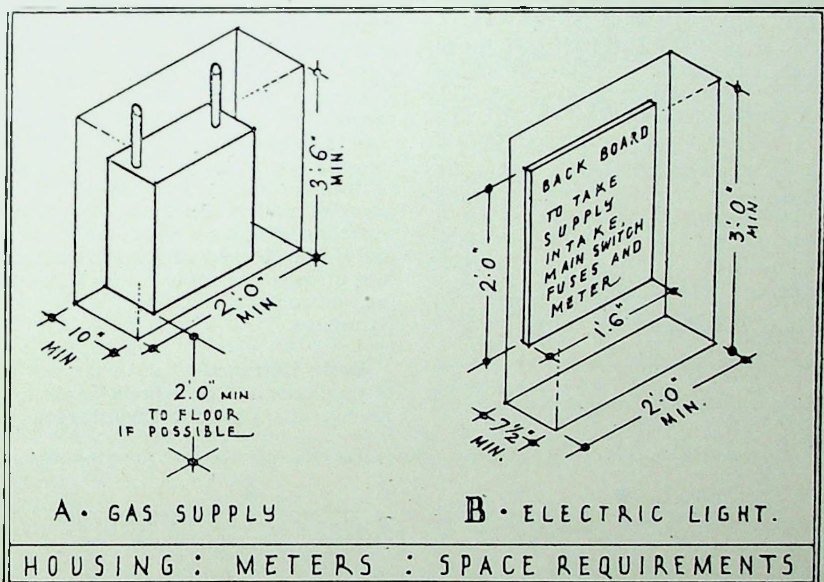


Figure 11

sinking, or the external step should be raised about one inch above the internal floor level.

Halls—The hall provides access space for all ground floor main rooms and for the staircase. It is essential that it should have direct and adequate daylight. Accommodation should be provided for storing a pram, as the latter and its bedding must be kept dry and this is seldom possible in unheated outbuildings ; not only should there be pram storage space of 4 ft 6 in by 2 ft wide and 3 ft 6 in clear height, but also space in which to move the pram into the storage space ; frequently pram spaces are shown on plans into which it is almost impossible to put a pram except by lifting it into position ; examples of this type are shown in Diagrams B and D on Figure 10. Diagrams A and C show good arrangements of pram spaces and it should be noted that more spacious halls result, an asset generally appreciated by occupiers. Planning the staircase on the front wall on long-frontage houses, as in Diagrams A and B on Figure 10, also makes possible a ground floor W.C. in the convenient position shown.

It is as necessary to provide for prams to be taken into flats as into houses, although pram sheds at ground level or in basements are often planned in conjunction with blocks of flats ; such pram sheds may serve also for general storage. It should not be necessary to store cycles in the hall of either flats or houses, as provision for these should be made in outbuildings.

Accommodation should be provided in halls for the storage of hats and outdoor clothing either in moveable or fixed furniture ; the normal provision of a few hat and coat pegs is undesirable ; they provide bad storage, are unsightly and tend to be in the way. It is preferable that such accommodation be planned in a recess, so that circulation spaces are not obstructed ; if a cupboard can be installed it is even more satisfactory. Recesses if used should be either 1 ft 8 in wide and 9 in deep, or 1 ft 8 in deep and 12 in wide ; the former provides for the use of hangers parallel with the back wall and the latter allows for hanging at right-angles, which is more satisfactory. If exposed coat and hat pegs are used the recess need not be deeper than 6 in and hooks should be about 9 in apart. If closed cupboards are used they should be based on a minimum depth of 1 ft 3 in for hangers parallel to the door, with a minimum width of 1 ft 8 in. in the clear ; it is better to use hangers at right-angles to the door and the dimensions can then be reversed ; if possible, the width of such a cupboard should be increased to 2 ft 6 in ; such a space will hold ten coats. The cupboards should have the hanging rod at least 5 ft above the floor level and 6 ft if shoes are to be kept on the floor. A high-level shelf for hats is required and should allow a usable height of 8 in.

Space must be provided for gas and electricity meters, the latter with its distribution board ; the hall is a convenient position in which these may be planned, but it is undesirable that they should be at the back of a deep cupboard, as, for example, at the back of an understair cupboard, since pre-payment meters to which frequent access is needed are common in housing. The coin slots of meters should be at a convenient height, and placed where good light reaches them both by day and night. Figure 11 illustrates

the amount of space which should be provided to accommodate electric meter boards on which all the necessary distribution apparatus can be fixed, and for gas meters, together with the space required for piping and control valves. These may be enclosed in cupboards, either singly or together; in the latter case a fire-resisting and preferably air-tight separation (for example, asbestos sheeting) is desirable to insure safety.

Fuel storage is, in some schemes, approached from the hall to avoid going outside at night or in winter; such a position may, however, cause dust and dirt in the house and it is not rooms. Halls and corridors have in the past often been too cramped, due to very small total floor area allowances, but with the general increases now advocated the reason for such cramping is eliminated; on the other hand, hall and corridor space is not truly effective living space and should not be wasteful.

Artificial lighting of halls and corridors should be planned carefully to light the whole floor area, the stairs, visitors at the front door, and to give light into shallow cupboards.

Staircases—Staircases in housing have often been, for reasons of economy, rather too steep for comfort. With the increased floor areas of dwellings it should be possible to change this practice. The pitch, which is the important factor, should not exceed 42 degrees; the going should not be less than 8½ in, and treads can be made at least 9 in wide. The relation of riser to tread should be such that twice the riser plus the going should be equal to between 22½ and 23½ in. Winders should be avoided whenever possible, and when used are better placed at the lower end of flights. When winders are used three may occupy a quarter space and five a half space. Staircases should not be less than 2 ft 11 in wide, measured over the strings. A handrail should be provided on one side, at least, of all staircases and should be placed at a height of 2 ft 9 in measured vertically above a line joining the nosings of treads. Handrails when used horizontally, as on landings, should be at least 2 ft 9 in, and better 3 ft above the floor. Headroom is most important, although this usually has to be reduced to the minimum, and should be at least 6 ft 6 in measured vertically from a line connecting the nosing of the treads and provide at least 5 ft clearance at right-angles to this line. Figure 12 illustrates these minimum requirements for staircases, and also makes clear the spaces which are available for cupboards, and similar purposes both under and over the flight. Those parts of understair spaces which are less than 4 ft high are of little value and if not blocked off tend to accumulate undesirable rubbish which seldom gets moved and thus attracts dirt and dampness.

Back Entrance—This entrance is often planned to give direct access into the kitchen, but it is advantageous to

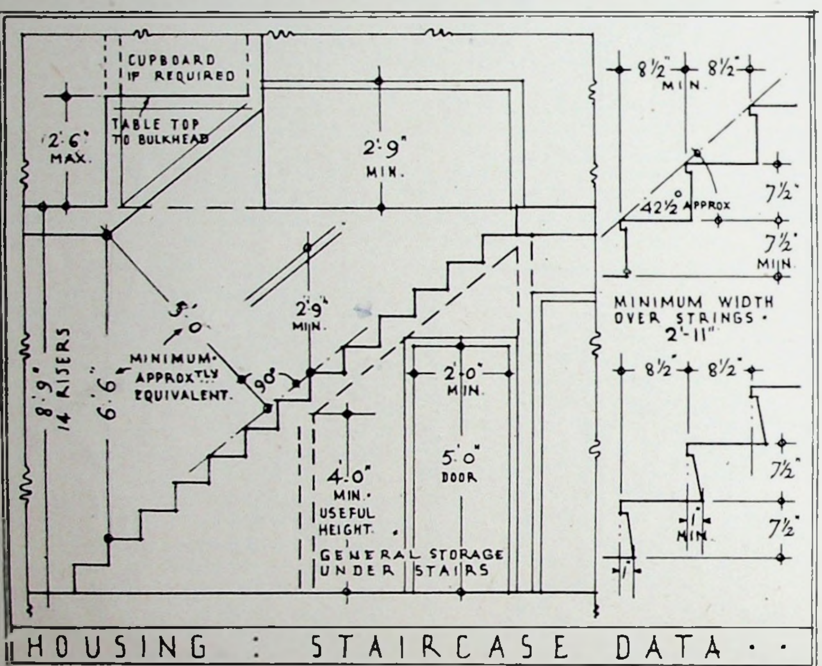


Figure 12

usually possible to provide adequate storage space to meet the full needs of an average house. Fuel storage is referred to later in this section. Fuel storage for flats is frequently planned off the hall, as other positions are difficult to arrange within easy reach of each tenant.

It is probably better to use understair cupboards for general storage rather than for meters and the like, as such spaces are often badly shaped and rather inadequate for more definite uses.

In flats all rooms should open off the hall and any corridor continuation of the hall. Main storage and linen cupboards should also be similarly accessible.

Corridor or hall widths should not be less than 3 ft, but 3 ft 3 in and better 3 ft 6 in, are more satisfactory, as if these circulation spaces are too narrow it is difficult to move furniture into rooms and also to manipulate the pram; it should be borne in mind that the latter is often used for daytime resting and play-space for very young children, and is sometimes taken into the living

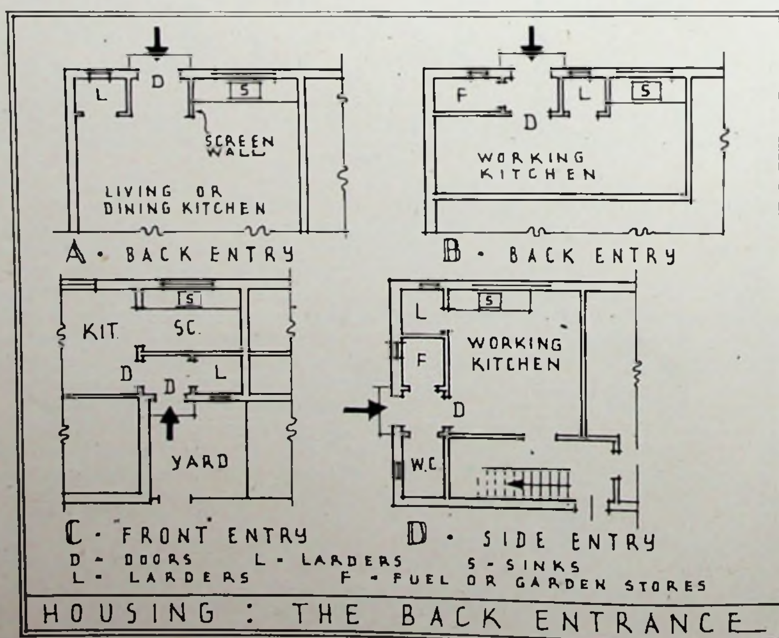


Figure 13

avoid this method, if possible. The usual plan is similar to that shown in Diagram A in Figure 13, though the screen wall adjoining the sink is often omitted and the window and door constructed to form a single unit ; the addition of the screen wall as shown and especially if an inner door is used, greatly assists comfort and working conditions.

Back doors should not be less than 2 ft 6 in wide and are better if 2 ft 9 in, and should be planned so that the open door screens direct draught from the sink and any fuel-burning appliances. The very common arrangement of grouping door and window in a single unit is undesirable and makes the hanging of curtains very difficult.

When a covered recess can be planned at the back entrance it is very advantageous, especially if such access is first to a scullery or utility room, where dirty boots and wet clothing may be removed before entry into the house.

Diagrams B and D of Figure 13 show the formation of recesses at the entrance and giving access under cover to the fuel store, and also in Diagram D access to a ground floor W.C. which is only semi-external. It may often be found difficult to adopt a plan as shown in Type B, as the kitchen tends to become very long and an additional end window is really desirable to ensure adequate light. Glazed doors on the inside of recesses as shown do not give much extra light to the room.

The plan shown in Type C necessitates a long frontage, but as already mentioned is a method of avoiding through passages for access to the kitchen. Such a plan greatly assists the comfort of the kitchen, provides a larder which is separated from the warm atmosphere of the kitchen and consequently provides better conditions for food storage. Type D is only applicable to detached, semi-detached and end houses of blocks.

An external lighting point is very useful at back entrances, especially if it can be placed to light the approaches to outbuildings and fuel stores.

Living Rooms—There are certain factors common to all or several types of living room, such as the essential furniture, placing of fires, windows and doors and these should be considered in conjunction with aspect, prospect, and day and artificial lighting. It is necessary first to consider various basic types of living rooms, as varying uses have influences on the plans to be adopted. It is impossible to say that any one type is better than others, and estates should provide for different types of living room if tenants are to be given a reasonable choice of houses to best suit their own way of life. The important factor is to try and so plan the house that full use is made of the whole of the available space, but it is likely that good distribution of heating facilities may contribute more to this end than actual planning.

The types of living room are :

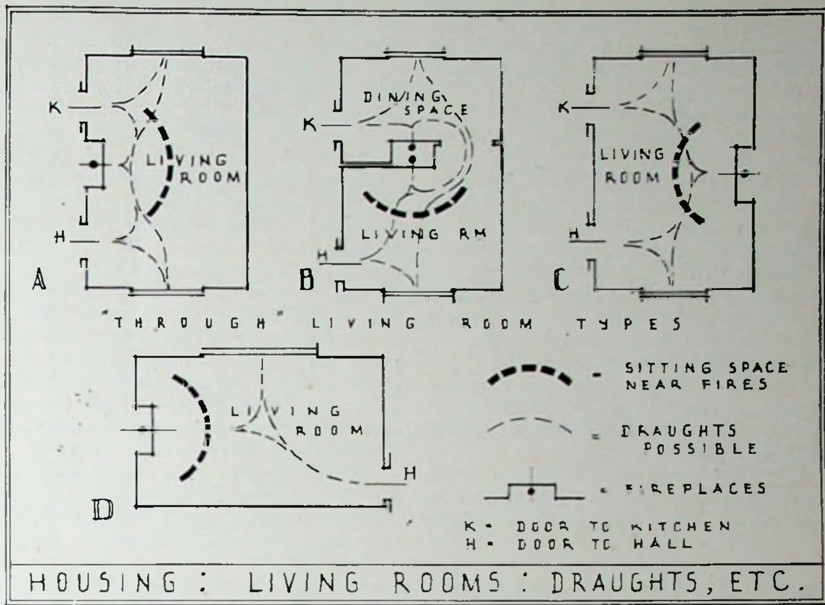


Figure 14

1—The combined kitchen-living room in which the family has to cook, eat and carry on all the activities of family life. This type usually has a scullery attached to the living room, with direct approach without passing through the hall.

2—The dining-living room, in which those meals not taken in the kitchen are eaten, and in which general family life is carried on, but no cooking takes place in it.

3—The living room used only for general family life, cooking being in a kitchen and meals taken either in the kitchen, dining kitchen, or in a separate dining room.

4—The living room with dining recess, but without facilities for cooking as in Type 1.

In all types there may be a second living room, referred to in this section as the sitting room. Formerly this room has usually been called the parlour. These rooms are generally similar to No. 3 above, excepting that the area is usually somewhat smaller.

The use of the living room tends to centre round the fireplace, which must be so planned that a group of chairs may be arranged round it without interruption by circulations, nor must any part of such a group be untenable due to draughts between doors, windows and the fire. Even if the open fire becomes less used and is replaced by openable stoves by which means greater value may be obtained from the fuel consumed, the same planning conditions must be met and even if central heating should become general some local heating such as electric or gas fires will be needed and will thus necessitate somewhat similar planning. Fireplaces are best if planned centrally on a wall not less than 11 ft long, with side light from the window. Corner fireplaces should always be avoided. The type of fire depends on the precise use of the room.

Figure 14 illustrates various type layouts of living rooms and the relationship of windows, doors and fireplaces to one another and their effect on draughts and circulations in the rooms. The " through " types of living rooms, as shown in Types A, B and C, are the most difficult to plan if draughts are to be avoided between doors, windows and fireplaces. From the point of view of draught, Type A is possibly better than Types B and C, as the air from the doors draws more directly into the fire and the occupants can, to some extent, sit beyond or outside the main draught lines, but from the point of view of sitting comfortably round the fire the doors are too close to the fire and circulation interrupts the " family circle." Type C may be slightly more draughty, but the circulations between the room doors will not disturb the sitting space. Type B is likely to be unsatisfactory both from the aspect of draughts and interruption of the sitting space by circulation ; the dining space is also likely to be draughty ; for these reasons the omission of the connecting doorway or opening between this space and the living room may make both rooms much more pleasant, even at the cost of a little more walking for access between parts of the house. Type D illustrates the best arrangement of a " non-through " living room to avoid draughts.

Rooms are generally more satisfactory if rectangular rather than square, but irregular shapes should always be avoided, and also rooms which are very long and narrow. The minimum dimension in either direction should not be less than 11 ft. It is better that the lighting is on one of the longer walls, unless it can be from the two ends, although rooms with light from both ends make it impossible to sit at

either side of the fireplace without facing the source of light from a window. Rooms of greater depth than 12 ft from a window wall are undesirable, but are sometimes unavoidable with narrow frontages in terrace houses.

All living rooms should be planned to accommodate a normal amount of furniture dependent on what other rooms are provided in the house. Windows and doors should be so planned to leave good wall spaces against which furniture may be placed. Some built-in furniture may be required, which should be confined to cupboards and bookcases, and generally this is not large in quantity, as occupiers prefer their own furniture in these rooms.

Doors in living rooms should be as few as possible and not less than 2 ft 6 in wide. Windows should be equivalent in area to at least one-tenth of the floor area ; one-half of the total window area should open, unless daylight obstruction is exceptional. Tall windows, with heads as near the ceiling as lintels will permit, give better lighting than long horizontal windows of equal area, and leave more wall space. The glass line of windows should not be much less than 2 ft 2 in above the floor level, which provides a good outlook from a seated position and avoids cold air near the floor. Unnecessarily large windows should be avoided, as the heat-loss through windows is very considerable unless double glass or double windows are used ; the expense of such provisions is very costly. A combination of windows and doors are frequently used, especially to give access to the garden, but great care in planning and in constructional detailing are needed to avoid undue draughts, especially at floor level.

Heights of rooms must conform to the statutory requirements of 8 ft (or 8 ft 6 in. in a very few districts), but heights greater than this essential requirement are seldom necessary as the floor areas are so small ; also, any increase in height above the minimum involves both increased capital and maintenance costs without return.

Artificial lighting should provide for lighting over the dining table if the room is used for meals. General lighting from ceiling fittings is usual, together with one or more socket outlets for standard or table lamps ; the illumination should be equal to 3 foot candles (f.c.) over half the area of the room, increased by the local lighting to about 15 f.c. for reading and sewing. Socket-outlets are not only used for local lighting but also for radio, sewing machines and similar domestic appliances.

Kitchen-Living Room—It is recommended that the floor area should be 180 to 200 sq. ft., except when a sitting room is provided in addition, when the area may be reduced to 170 to 180 sq. ft. The room should have an appliance which will combine cooking, room heating, and heating water ; it therefore seems that solid fuel is likely to be used in almost all cases ; many occupiers prefer to use types of cooking appliances with an open fire, which is more pleasant, as the room is essentially also a living room as well as a kitchen. More recently developed types of these appliances have fires based on the " openable-closed " stove principle, which should be more efficient for both water-heating and cooking, without any loss of the general comfort provided by an open fire. The room must be planned to provide sitting-space round the fire, table-space for meals, and space for the essential storage fittings. A scullery should adjoin this type of living room and have direct access from it ; the scullery should accommodate the sink, the wash-boiler (if not in a wash-house) and facilities for summer water-heating and cooking by electricity or gas, if available.

This type of living room, although so widely used in the past, is the least satisfactory in many ways, especially as family life is disturbed by cooking and meal service, but on the other hand it is probably the most economical form of living. If, however, total floor areas for dwellings are to be increased from the pre-war areas to 900 sq. ft. or more for a three-bedroom house, it seems possible that the combined kitchen-living room will be less widely adopted, except perhaps in rural areas.

The essential storage fitments should include a broom cupboard, a dry-goods store and the " dresser," or better its equivalent in the form of cupboards in which china, glass, cutlery, etc., may be kept. It is better if the broom cupboard is placed in the scullery, but in this type of room the dry-good store and the dresser are more valuable in the living room near the table where food is prepared and the cooker.

Figure 15 illustrates a typical kitchen-living room, with scullery attached. It should be noted that the doors in both rooms are planned on one side to avoid draughts in the main working and sitting spaces. The dresser is placed so as to be convenient to both the cooker and the table ; it is probable that the dry goods store may be preferred adjoining the dresser instead of the larder. The drying cupboard is planned near the fire to reduce the length of circulation pipes to the cylinder, but if this is to be used for drying laundry, a position on an outside wall is desirable in order to provide sufficient ventilation ; also the cylinder must be placed elsewhere, as, for example, in a linen store on the upper floor.

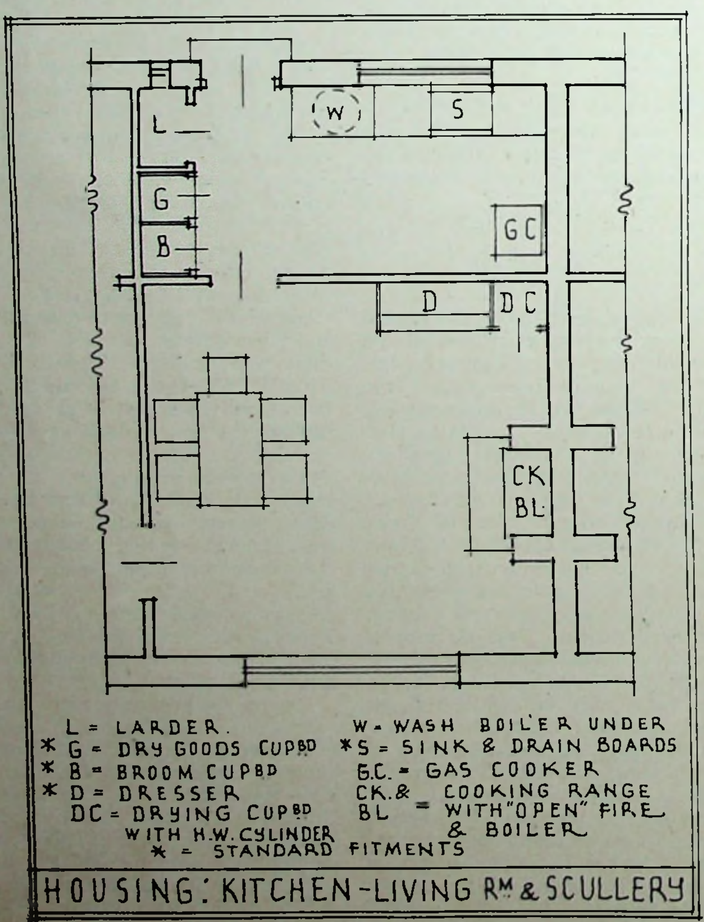


Figure 15

Dining-Living Room — Generally these rooms should be similar to the

kitchen-living room except that the area might be reduced a little, although only a small amount of floor space can be saved due to the removal of the cooking appliance and certain equipment, such as the dresser, into the kitchen. An open fire or closeable stove takes the place of the cooker, but this may still have to be provided with a back-boiler for water-heating, unless a separate boiler or a back-boiler to the cooker is installed in the kitchen. The storage fittings are transferred to the kitchen so that these fittings may be in correct relation to the preparation of food and washing-up. It is desirable that a hatch is planned between the kitchen and the living room unless a door is planned in its place ; the hatch may involve more walking from room to room, but it tends to make the living room more pleasant and reduces draughts between it and the kitchen. The room should be so planned that the table does not spoil the sitting space round the fire and is placed where there is good daylight.

This type of living room does not seem likely to be used very widely, although it tends to assist in making a very full use of the whole of the floor space provided and all cooking is confined to the kitchen ; nevertheless, the formation of a dining recess as outlined below seems preferable. This type of room is likely to be in the form of a "through" room in order to provide adequate light for both parts, unless used on a narrow frontage site.

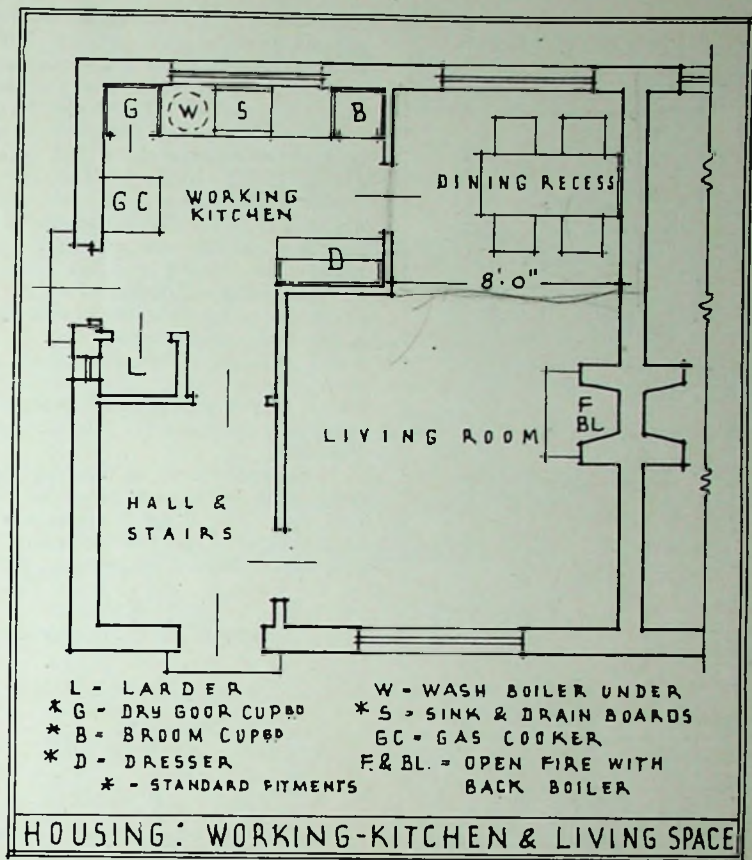


Figure 16

Living Room without Dining or Cooking Facilities—This type of living room may be reduced in area to 160 to 180 sq. ft., due to the elimination of the large table necessary for meals. Direct access between the room and the kitchen or dining-kitchen may be desired, but it should be borne in mind that any additional door to that between the room and the hall uses valuable wall space, tends to create draughts, and is apt to cause inconvenient circulations which restrict furnishing and the full use of the room.

Living Rooms with Dining Recess—The floor area of rooms of this type should be larger than kitchen-living rooms or dining-living rooms without a recess ; the recess is used mainly for meals, although the table is likely to be used for some other purposes such as homework. It is suggested, therefore, that the area be at least 210 sq. ft., and, better, from 225 to 245 sq. ft. The room should be planned to give a defined space to the dining recess, which should not be less than 8 ft wide ; space should be allocated for a sideboard and for a food trolley, the latter near the door to the kitchen. Direct access from the dining recess to the kitchen is desirable, but a hatch may be substituted.

It is desirable that there is some means of heating this recess in cold weather, as the main fire may not do so satisfactorily ; this secondary heating may well be a radiator from the room fire, or alternatively a small gas or electric unit.

If the table is likely, as is possible, to be placed adjoining the window, the sill level should be kept above the table level of 2 ft 6 in, and therefore about 2 ft 9 in above the floor level. Circulation round the table may best be achieved by placing the table as indicated on Figure 16, which illustrates a typical lay-out of this type of living room, with its relationship to the kitchen and the hall. The storage fittings in the kitchen are all planned to be in good relation for the preparation and service of food.

Living Room Where a Separate Dining Room and Kitchen Are Provided—In houses having this accommodation a second living room is unlikely to be provided ; thus the dining room itself will probably be used as a sitting room, in addition to meals. The floor area of the living room might therefore be reduced to 160 to 180 sq. ft.

Sitting Room—Very varied opinions have been expressed as to the desirability of providing a sitting room in addition to the living room, or whether it is better to throw the whole available floor space into one large room. The second room provides an opportunity for quiet and privacy which are almost impossible in one living room in a family house ; it is also a room which is generally more tidy and thus available for visitors without clearing up the general living room. It might with advantage serve as a quiet room for homework for the older children.

These rooms should have a floor area of at least 120 sq. ft., but areas up to 160 sq. ft. are very desirable. It is not so important to increase the floor area of sitting rooms in houses for families greater than five persons. As in living rooms, family life tends to centre round the fire, which is best placed with sidelight from the window. As the room is used intermittently, gas or electric fires are often preferred to solid fuel owing to the possibility of obtaining a rapid heating-up of the room ; it seems, however, that it is desirable to provide a flue suitable for burning solid fuel to meet the wishes of those who prefer this form of heating.

Living Rooms Generally—The floor areas so far given for living and sitting rooms are those needed for three-bedroom houses in which a maximum of five persons may be assumed. Where the family is to be larger it is desirable that the areas should be increased by 10 to 20 sq. ft. per person, the number for whom the bedroom accommodation is planned over the first five persons. Where houses are designed for less numbers the living room may well be reduced to 150 to

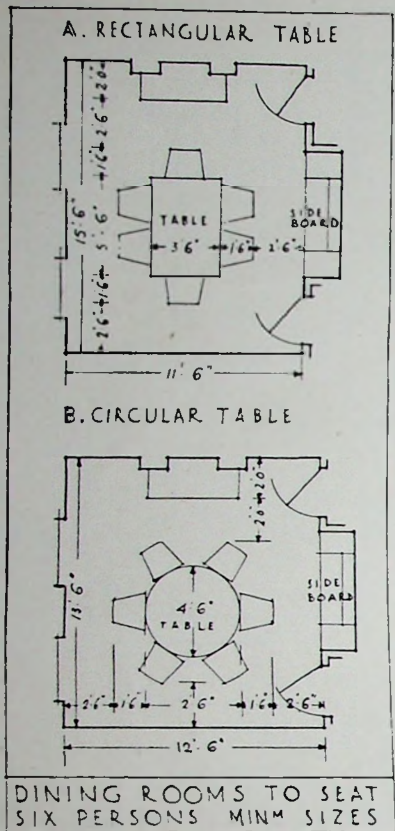


Figure 17

160 sq. ft. for two-bedroom houses and to 140 sq. ft. for a one-bedroom house. In dwellings for old people the living room should have an area of at least 140 sq. ft. to which should be added any space needed for bed recesses, etc.

Dining Rooms—This paragraph refers to dining rooms which are separate from other living rooms, although it is probable that such rooms will be used for other purposes than only meals, as, for example, for children's homework, for which a table is essential, and it is probable that the kitchen will be the only other room having a table adequate for this purpose, especially if there is more than one child working simultaneously. Separate dining rooms would appear to be necessary only in larger houses than those of minimum area for the three-bedroom type.

The floor area of a dining room should not be less than 140 sq. ft. The room should be either square or rectangular, the latter being preferable, as the most general shape of tables is also rectangular, especially when fully extended. The dining room should not be less than 10 ft 6 in wide. Windows should be placed on a long wall whenever possible, and it is advantageous to place the sill level above the table level of 2 ft 6 in, which permits the table to be placed close to the window if desired.

Figure 17 illustrates the dimensions necessary for dining rooms in order to seat six persons with reasonable comfort, and at the same time retaining adequate circulation space; but in order to provide these dimensions areas greater than the minimum suggested above are needed. The recess formed on one wall to receive the sideboard can be omitted to save space and a hatch giving direct access to the kitchen substituted. Dining tables are usually about 3 ft wide, although some of the narrower widths are generally available. Care should be taken to avoid the planning of doors so that they obstruct the best placing of the table.

Dining recesses when part of the living room have been discussed in this article, but when planned as an adjunct to or part of the kitchen they will be discussed in detail under Kitchens.

If the room is to be used for meals only, with occasional other intermittent use, such as for homework, solid fuel fires may not be required, and preference should be given to gas or electricity, possibly supplementing hot air heating or hot-water radiators from the living room fire; if, however, the room is likely to be in general use as a sitting room, more continuous types of heating may be required.

Doors should be as few as possible in dining rooms; direct access to and from the kitchen may be considered desirable in small houses, but it is often convenient to use a service hatch in preference to a door, since by its incorporation in a cupboard fitting much space may be gained. Doors should not be less than 2 ft 6 in wide, so that wheeling of trolleys or the carrying of trays is possible.

Artificial lighting is essential over the table and at least one socket outlet should be provided for small appliances in addition to any outlet provided for a fire.

Service hatches when provided should not be less than 15 in high in the clear and 2 ft wide when the doors

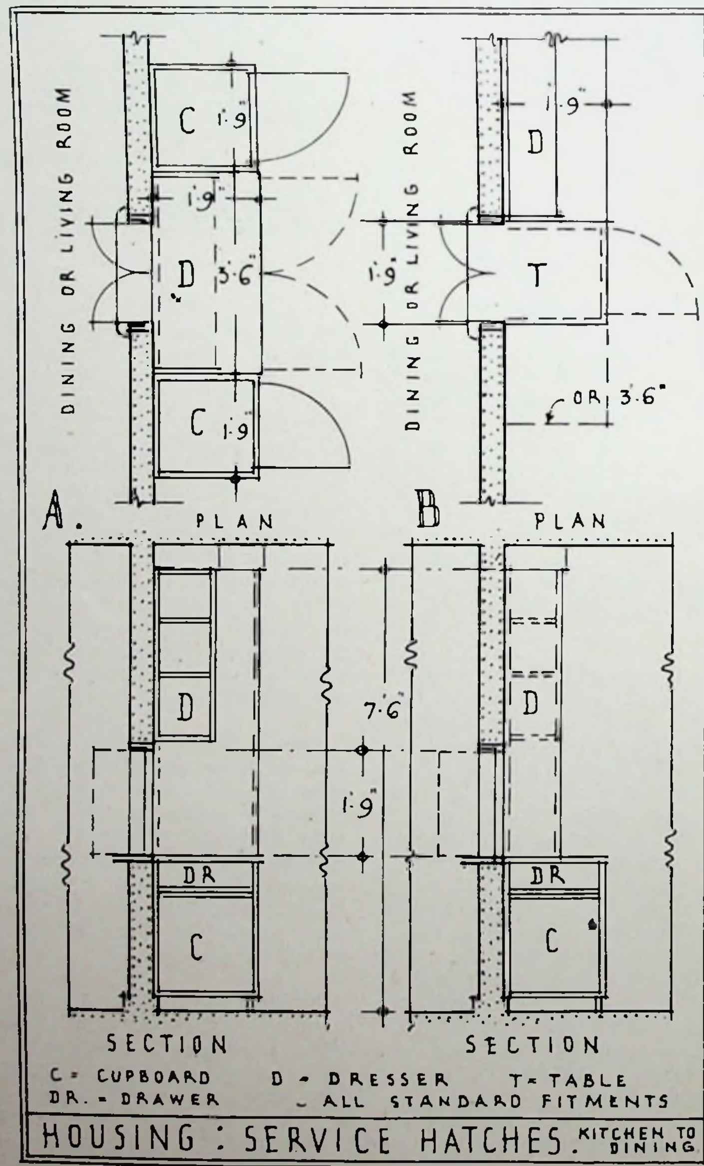


Figure 18

are open ; they should be so arranged that there is shelf for table space available on both sides either under the opening or in very close proximity.

Figure 18 illustrates two types of service hatch, each based on the essential dimensions of B.S. 1195, Kitchen Storage Fitments. Type A is formed as part of a dresser fitting installed between two tall cupboards, and Type B is formed by using a low cupboard either 1 ft 9 in or 3 ft 6 in long adjoining a dresser fitting, thus providing a considerable length of table space adjoining the hatch opening. A development of a fitting shown in Type A is to use it to form the partition between the room in which position the drawer or drawers below the table top may open into both rooms and the cupboards may be similarly designed, if required.

Kitchens—The combined kitchen-living room having already been discussed under living rooms, it is now possible to pass to the working kitchen and to the kitchen-dining room.

The kitchen plan is a complex problem ; it is the workshop in which the housewife performs many operations of widely differing natures. Good and lavish equipment by no means provides a solution ; for, unless such equipment is properly arranged and the space is planned as a whole, labour and effort is not reduced ; it is the relationship of equipment to use and the sequence of operations that are the important factors. There are three main groups of work to be planned for in the kitchen : food preparation, washing-up and laundry work ; it is, of course, better if the last is relegated to a wash-house or utility-room whenever possible and the space can be provided. Certain units of equipment such as the sink, are used for more than one of these groups of work but broadly, each group has special units associated with it. It is therefore of the utmost importance to consider carefully the sequence of work and the fittings involved in order to plan the whole correctly. It must also be borne in mind that a housewife is seldom able or in fact needs to spend much time over any one operation ; she is constantly changing from one type of work to another, and that implies compromises which are always necessary in the types, position and working heights of fitments ; if the same working operations are to be performed for many hours continuously, such compromises or " averages " do not so often arise.

The sequence of operations in connection with meals are :

1—Delivery or collection of goods, together with storage.
2—Preparation of food.
3—Cooking.
4—Preparation of the dining table.
5—Distribution of food to the table.
6—Return of food and crockery from the table.
7—Washing-up.
8—Putting away of washed-up crockery, glass and cutlery.

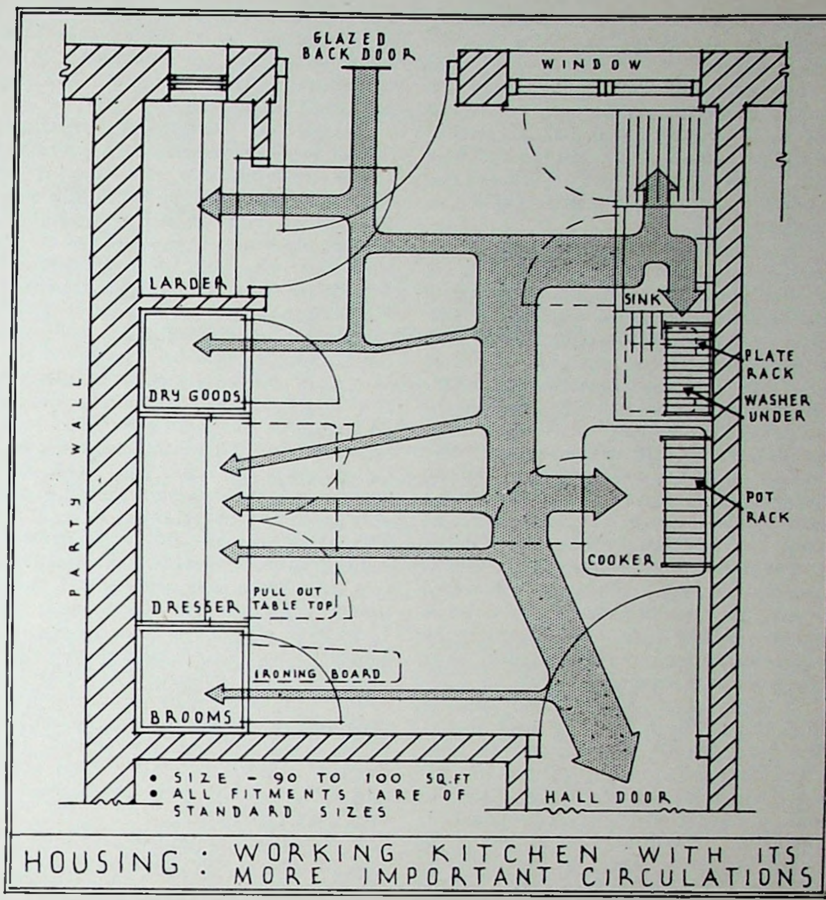


Figure 19

Item 1 involves the larder, store cupboards and, if provided, the refrigerator. Item 2 needs the use of work-top and table-top surfaces, together with the sink, and these must be closely related to each other and to the larder and cooker, the last being the major feature of item 3. Item 4 requires, linen, china, glass and cutlery, to be taken from storage to the table, partly by way of the work-top, or in the case of hot plates and dishes, by way of the cooker, and cannot be completely separated from item 5, which involves the conveyance of food from cooker and work-top, together with some food directly from storage to the dining table. Item 6 reverses the processes of items 4 and 5, to which surplus food is returned to storage, dirty china and cutlery to the sink, clean china and cutlery, together with linen, to storage. Item 7 is a considerable process, requiring in itself several distributive movements, while item 8 is somewhat similar to part of item 6.

Figure 19 illustrates how the equipment for kitchen operations may be arranged to meet the sequence of operations with a minimum of expenditure of time and effort ; the shaded arrows are an attempt to indicate the approximate amount of traffic between the various pieces of equipment ; from this figure it will be obvious which equipment should be placed together and which should be nearest to the dining-room. The ideal lay-out for a kitchen can seldom be achieved owing to the complex nature of the various factors. A number of figures used to illustrate other parts of this series also show outline lay-outs of kitchens and should therefore be referred to.

The other main work apart from food preparation and service in which the kitchen is involved is that of laundry ; this may be divided into three sub-groups, washing, drying and ironing, of which the first is in itself a series of separate operations. It is undoubtedly better if laundry work can be kept apart from that of cooking by the provision of a wash-house owing to heat, steam and smell involved, apart altogether from any consideration of the dislocation of the normal use of the kitchen ; this last point may not be thought so serious since the same person, the housewife, usually has to do both laundry and cooking and even at the same time look after her children at play.

Floor areas for working kitchens, in which it is assumed that only minor meals are served, should be 90 to 100 sq. ft., but for dining-kitchens the area should be increased to 110 to 125 sq. ft. Kitchens with definitely separated

dining-space, as for example, a dining recess, require larger areas for reasonable comfort.

The information already given for dining recesses forming part of living rooms is equally applicable to dining recesses attached to kitchens. The dining recess should be cut off from the working part of the kitchen as much as possible.

In order to plan kitchens with correct sequences of operation it is probably best to commence by fixing the position of the sink and the cooker. Sinks should preferably have the window directly in front of them, but near side-light may be satisfactory and the wall-space behind the sink is very valuable for such items of equipment as plate-racks and utensil-racks. The cooker should have good light on the hot-plate and into the oven, but at the same time it must be planned to be away from draughts between doors and windows ; side-light to cookers is usually the best ; if placed in front of a window the interior of the oven is badly lighted and if opposite the window the user casts a shadow over the working surfaces.

It is essential to have good lighting in kitchens both by day and night. Windows should be planned to give even and adequate lighting for all working areas, and particularly for the sink, cooker, and the food preparation surfaces. Windows should reach as near the ceiling level as possible for reasons of ventilation as well as for lighting. It is better that windows be rather larger than the statutory minimum. Artificial light can seldom be provided adequately from one source ; two points, at least, should be provided, if possible ; the light value should be at least 5 f.c. and, better, 6 to 10 f.c. on main working surfaces.

If sinks are placed under windows, the sill level should be at least 3 ft 3 in above the floor and even then a type of sink with a back shelf through which the tap unions rise should be used. If supply pipes and taps are fixed to the wall over the sink, the window sill should be 3 ft 9 in above the floor. Sinks should be not less than 1 ft 3 in by 1 ft 9 in water area and if to be used for laundry should be capable of containing 7 to 8 gallons of water, and this is about the size of the normal 24 in by 18 in by 10 in fireclay sink. Sinks of less depth may be satisfactory for washing up only, but deep sinks have advantages when washing pots and preparing vegetables. At least one and, whenever possible, two draining boards should be provided, each not less than 21 in long and, better, much longer. Sinks should be at least 2 ft 10 in high above the floor to the rim, and if to be used in conjunction with other fittings, a height of 3 ft is now usual and will be found to be quite satisfactory, especially if the sink is to be used for laundry work. (See British Standards, 1195, 1206, 1244 and 1255, which give information of kitchen equipment.)

If the sink is to be used for laundry, and unless a mechanically-operated washing machine is to be installed, it is usual to hinge one draining-board and plan beneath it a wash-boiler, heated by gas or electricity and to provide for fixing a wringer between the wash-boiler and the sink, either on the boiler itself or on the rim of the sink. (See Figure 20.) When a tub and sink combination is used provision is made for the wringer between the two parts. Such an ideal lay-out cannot always be achieved when a solid fuel wash-boiler is installed, due to difficulties of planning the necessary flue. The tub and sink combination is an appliance usual in Scotland, and though little used elsewhere, has many merits ; not only is the deep tub, at least 13 in inside, ideal for laundry work, but also for washing large utensils and vegetables. There is also the advantage that the sink used for food preparation does not need to be used for laundry. Tub and sink combinations require more space than a sink ; they are 4 ft long by 2 ft wide, but if a loose draining-board is fitted over the tub the effective length of the sink and draining-boards remain about the same.

It is now general to make the work-tops of the normal range of fittings at one level, namely, 3 ft above the floor ; this height being dictated by the inside surface of the bottom of the sink, which should be about 2 ft 3 in above the floor to avoid excessive stooping. The 3 ft level is very satisfactory for many purposes, although it may be a little high for some operations ; it is, therefore, desirable to plan for the installation of one part of the working surface at a height of 2 ft 9 in or 2 ft 10 in ; this may be done by the use of a flap-table or by a pull-out work-top on the dresser fitment. It is also desirable to provide space for a small table of normal height at which work may be performed when seated on a normal chair.

It is considered by many authorities to be better, although it is less attractive in appearance, not to enclose spaces under sinks and draining boards, but to install grids on which utensils may be stored. It is particularly difficult to keep cupboards under sinks or draining-boards clean and dry when wooden or other applied draining-boards are installed, as it is impossible to make the junction between the draining-board and the sink rim watertight ; also, water and condensation may run down the back wall, finding their way into cupboards by way of the joint between the draining-board and the wall. The minimum length of 8 ft of shelf space for utensil storage should be provided at a normal arms-length height, though it is obviously advantageous that handles of utensils placed on shelves should always be above normal head height. Shelving should, if possible, be placed in close relationship to both sink and cooker, but must not be in positions that the user has to stretch across the top of a cooker. It is desirable that draining-boards and work-top surfaces are 21 in wide, while 18 in should be considered to be the minimum.

The kitchens are usually best if of rectangular shapes rather than square ; and the lighting should be planned on

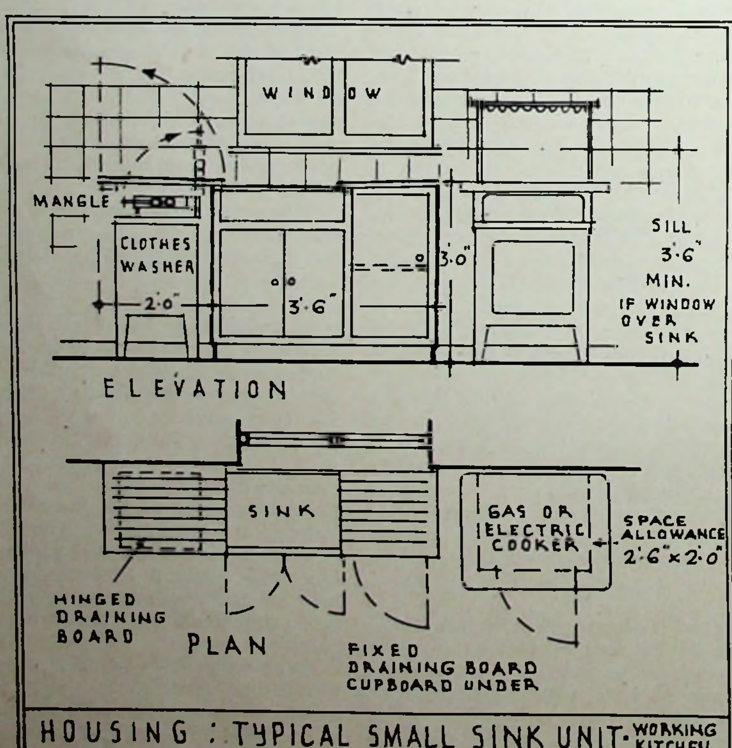


Figure 20

a long wall. In the past the floor areas have frequently been too small for comfortable working, and have not made possible the installation of a movable table. Tables are not only wanted for work such as the preparation of food, but also for uses such as ironing of laundry, as the folding ironing-board which is often installed is inadequate for larger articles such as sheets ; the table is also useful for some meals such as early breakfasts or for lunch for one or two persons, and for which it may not be necessary to prepare the dining-room table.

Much has been said regarding the possibility of kitchens being too large and causing unnecessary fatigue due to walking from one piece of equipment to another, but there seems little possibility of this condition in dwellings of the housing type. Medium-sized kitchens having comfortable space and correctly-related parts and fitments are more conducive to good working conditions.

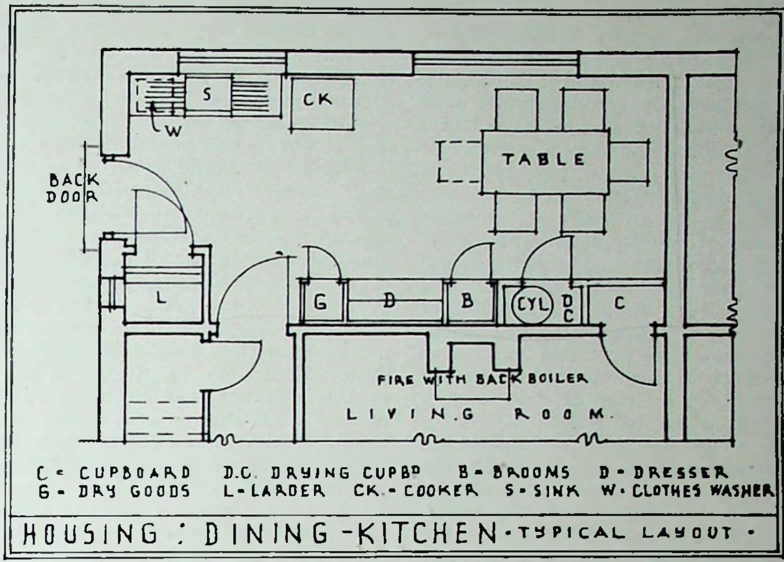


Figure 21

Kitchen-Dining Room—Kitchen-dining rooms should be planned to provide comfortable space for the chairs to be placed round a table without interruption of any process of food preparation ; it is more satisfactory if the grouping of fittings and furniture can be such that the room is virtually divided into two more or less equal parts. Figure 21 illustrates a typical lay-out of a kitchen-dining room. The larder is planned near the entrance and away from all heat units. The sink, draining-boards, wash boiler and cooker are planned together. The dry goods, dresser and broom cupboard are grouped together between the cooking part of the room and the dining portion. A drying cupboard containing the hot water storage cylinder is planned close to the back boiler to the living room, to reduce the primary hot water piping to a minimum. Two windows are planned, one to light the sink and cooker, and the other to light the dining table. A long rectangular room is likely to be the most satisfactory shape for kitchen-dining rooms. It is desirable to plan the back door well away from the dining table.

Storage Fitments—The minimum storage fitments for a house with three or less bedrooms should be a dresser or combination of upper and lower cupboards, 3 ft 6 in wide and the full height of the room, for the storage of china, glass, cutlery, etc. ; a dry goods storage cupboard 1 ft 9 in wide and at least 12 in deep and the full height of the room, and a broom-cupboard of similar dimensions. The dresser may usefully incorporate a hatch, if one is required (see B.S. 1195—Kitchen Storage Fitments). Wherever possible, however, the number of cupboard fittings should be increased from the minimum given here, especially for storage of china, glass and utensils. More particularly, is an increase necessary in the storage fittings in rural housing where there is a likelihood of the need for plentiful storage for home-made produce such as jam, pickles, bottled fruit, etc., coupled with the probability that shopping is less frequently possible.

Cookers—As it has already been stated, the type of cooker varies very considerably according to the type of house lay-out adopted. In many parts of the country, especially near colliery areas, there is a preference for cooking by solid fuel ; an open-fire combination range mentioned in connection with the living room is unsuitable for working kitchens or kitchen-dining rooms, where the cooker should take the form of insulated or semi-insulated types, working on the principle of continuous burning ; such appliances provide sufficient heat to warm the room and, at the same time, are more efficient than many older types of cooker. A type which has been used quite extensively is the " back-to-back " fitting, in which a fire in the living room heats the cooking portion of the appliance, which is placed in the kitchen ; this type of appliance has recently been greatly improved in efficiency and should be found economical in operation, but necessitates having a fire in the living room all the year round, also it involves the planning of the flue on the partition between the living room and the kitchen in such a way that the appliance is properly arranged for comfort and convenience in both rooms.

Gas and electric cookers are of two main types : firstly, and more common the vertical type, with the boiling-top placed over the oven ; and, secondly, the horizontal type, where the boiling-top and oven are placed side by side ; the latter type requires practically twice the length of wall space necessary for the former, and it may be found difficult to accommodate such a fitting in small kitchens. It would generally seem better to avoid building-in any cooker as part of a continuous range of fittings, due to the difficulty of making the joint between the cooker top and the adjoining fittings so as not to permit the percolation of liquids. It may, therefore, be better to treat the cooker as a free-standing piece of equipment, with at least 3 in. clear space on each side, to allow for cleaning the sides and to accommodate over-hanging saucepan handles. The types and sizes of cookers vary considerably in different districts, but a wall space of at least 30 in, and preferably 36 in, should be allowed ; the projection from the wall varies in normal-sized cookers from 21 in to 24 in.

Wash-Boilers—Gas and electric wash-boilers are usually of a nominal 10-gallon capacity which require floor space of approximately 21 in by 21 in, from which it will be noted that where these are to be placed under draining-boards, the latter should be 21 in wide.

Refrigerators—Before the war, a number of small dwellings were equipped with small refrigerators having a capacity of about 1 cu. ft. Such a capacity is not of great value for the three-bedroom house, and a capacity of about 3 cu. ft. is desirable. Refrigerators having such a capacity can be installed in a space approximately 21 in wide, 24 in deep and 34 in high, which permits of installation under a draining-board, but such a position is undesirable, and it is better that a cupboard fitting similar to the broom cupboard is used in which the refrigerator can be placed at approximately eye level. It is desirable that refrigerators are placed in the kitchen and not in the larder owing to the heat generated in the operation of such appliances.

Food Storage—The storage of food falls into a number of groups ; firstly,

fresh food kept in the larder ; secondly dry goods and, thirdly, bulk storage of such items as root vegetables, jam and bottled fruit. Reference has already been made to dry-goods storage and in part to bulk storage. Refrigerators, capacities for which have already been mentioned, are very desirable, but their provision would seem to have been demanded on many occasions as the result of badly-planned and badly-constructed larders. The justification of the cost of refrigerators in this climate is very doubtful when proper larder facilities are available. Bulk storage should be provided for items in the nature of garden produce in the garden shed, so long as it is so constructed as to be reasonably frost-proof, while goods such as jam and bottled fruit may be stored in the upper cupboards (those above normal reach) of the kitchen fitments, unless these are near sources of heat, since cool and ventilated storage is the most satisfactory.

Larders—Larders have often been inadequate in area and shelf space and constructed as cupboards with thin walls in hot kitchens ; also, in many instances, the ventilation is unsatisfactory, resulting in temperatures and conditions in which the storage of food is virtually impossible. Larders should be given a north or east aspect and should have ample ventilation, either by windows or gratings, both of which should be effectively protected against ingress of flies, wasps and mice. Windows are preferable in larders which are not well lighted when the door is opened. Larder windows are generally designed to open inwards to permit the easy fixing of external fly screens. Ventilators should be so arranged as to provide a current of air ; thus, a single air brick is of little value and one should be placed near the top and another near the bottom of the same compartment. The area of shelving needed must vary according to shopping conditions ; thus in urban dwellings small areas are adequate, but in rural districts where shopping is only possible at less frequent intervals much larger shelf space is essential. In urban dwellings larders should have at least 4 sq. ft. of clear space (about 2 ft 6 in by 1 ft 6 in) but a larger area should be planned whenever possible. The door should be placed on the longer dimension to obtain full benefit of the space available ; it should be 6 ft 6 in high, with upper cupboards for reserve storage, or better, the full height of the ground floor, with high-level shelving. One shelf should be of material such as compressed asbestos cement, slate or concrete. This shelf should be about 3 ft above the floor. Shelves should not be more than 2 ft 6 in. in depth, as it is difficult to lift dishes from a greater distance without risk of accidents. Wide shelves at a higher level than 5 ft above the floor are valueless for normal larder storage. Widths of shelves must be related to spacing apart of the shelves above and below. The lower part below the cold shelf may, with advantage, be fitted with metal grids on which bread and vegetables may be stored. Shelves should be placed about 1 in clear of walls to permit of proper circulation of air and should not be fitted too close to doors.

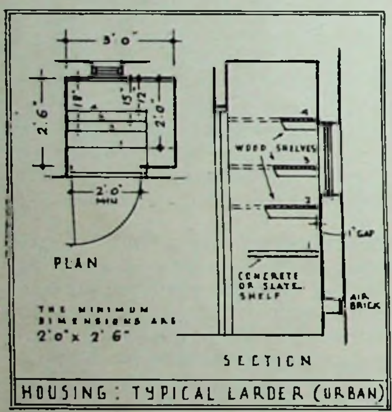


Figure 22

In rural dwellings larders should be increased to at least 10 sq. ft. in area and even more in outlying areas. Spaces about 4 ft long and 2 ft 6 in deep with the door on the centre of the long side are the most satisfactory. Shelves should be graduated in width ; shelves of more than 2 ft in depth are of little value, as also are shelves of less than 9 in wide. Ceiling hooks for hams and poultry are desirable in rural areas.

Floors of larders should be smooth and of materials which are easily cleaned, such as tile or granolithic. Walls also, should, unlike the general practice, be smooth and easily washable, as they tend to become very dirty especially near the shelves. The larders should be enclosed in such materials as will reduce heat penetration from the kitchen and should have well-fitted doors, especially when opening out from sculleries or kitchens.

Larders should not be put near cookers or ranges, and care must be taken in the design of pipe-lines to avoid the passing of hot pipes through larders. Larders opening out of kitchens and sculleries save much walking, but are less satisfactory for ideal food storage as those approached from corridors or lobbies.

Figure 22 illustrates a typical larder of normal dimensions for urban use which are rather greater than the minimum suggested above. It should be noted that the shelves decrease in width towards the top to permit of easy access to the topmost one.

Figure 23 illustrates a typical rural larder of the minimum dimensions desirable. It should be noted that air intakes are shown, in addition to the windows.

Sculleries—Sculleries, as dealt with in this paragraph, should not be confused with working kitchens ; the term has frequently been applied to the latter. In housing, sculleries are usually provided only for dwellings of the kitchen-living room type and not where there is a working kitchen or kitchen-dining room, or where the kitchen is planned and equipped as a self-contained unit. The floor area of the scullery should be 35 to 45 sq. ft., unless it is to be used also for laundry work, when the floor area should be increased to 65 to 80 sq. ft. ; areas such as those suggested here are, however, small and should be increased wherever

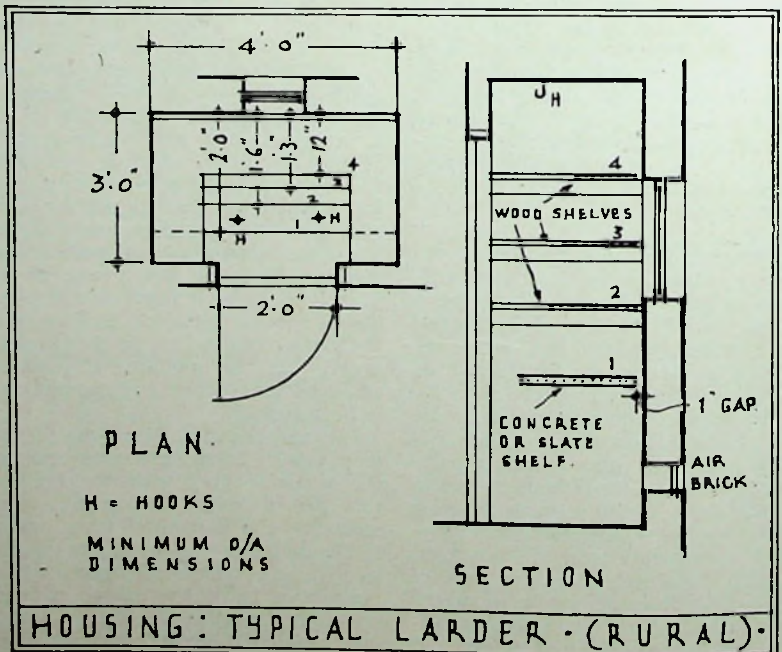


Figure 23

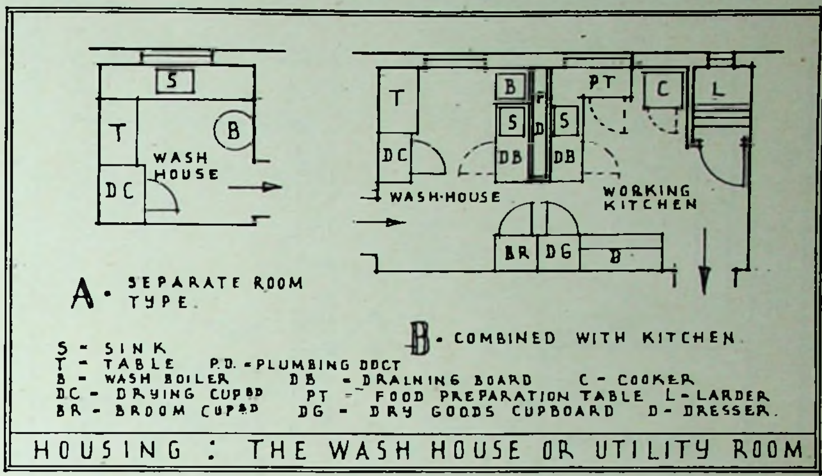


Figure 24

possible. The scullery should be planned to provide space for a sink and its draining boards, a work-top or table, a broom cupboard and some general storage, together with summer or auxiliary equipment for cooking and water-heating by gas or electricity, as available, or, alternatively, in rural areas, by oil fuel. Sculleries to be used for laundry work need the same appliances with the addition of a wash-boiler, ironing-board and drying-rack and possibly a drying-cupboard. As an alternative to the wash-boiler, space should be allowed for a washing machine, which will probably be a tenant's fixture not provided by landlord or builder. No provision should be made for meals to be taken in sculleries as their function should be confined to washing-up, food preparation and, if necessary, laundry-work. The back door should lead into the scullery and not into the kitchen-living-room.

Lighting conditions, both by day and night, both in relation to the room and the placing of the equipment, should be similar to that outlined for the kitchen. At least one electric plug point should be provided for small equipment such as an iron, a mixer or toaster. Figure 15 earlier in this section illustrates a typical lay-out for a scullery attached to a kitchen-living-room.

Utility Rooms—This title embraces mainly what has generally been known in the past as the wash-house. There are two alternative positions for utility rooms ; adjoining and possibly directly approached from the kitchen and as an outbuilding approached externally, either connected to the main building or as a unit grouped with the garden shed and/or fuel store ; there are some advantages in treating this room as an outbuilding in order to keep away heat, dampness, steam and smell of laundry work away from the house ; but against these advantages water supply services to the sink may become more complicated, especially in regard to hot-water supply. The provision of a utility room must, to some extent, duplicate equipment provided in the house, although appliances more correctly designed for special operations may be possible, for example, a laundry-tub instead of a sink. It is, however, questionable whether costs and floor areas will permit of the installation of separate utility rooms or wash-houses in dwellings which have to be subsidised to provide rentals within the lowest range of incomes.

Utility rooms require a floor area of at least 40 sq. ft. and are very much more satisfactory if increased to about 60 sq. ft. to give adequate space for equipment and correct lay-out. The room is likely to have a variety of uses such as laundry, workshop and storage for wet-weather clothing. The only fixed equipment needed is that for laundry work, but it is advantageous to leave space for a small bench suitable for odd jobs of wood and metal work, boot cleaning and repairs and the like.

Laundry equipment should comprise a wash-boiler or space for a washing-machine ; one, or better, dual wash-tubs with wringer attached (unless it is part of the washing machine) and one or more draining boards, preferably 3 ft run or more. A clothes drying-rack suspended from the ceiling and possibly a drying cupboard. There should also be an ironing-board with a suitably-placed electric- or gas-point for the iron and, if space permits, a table for ironing the larger pieces of laundry. Great care should be taken when planning the ironing board to ensure adequate circulation when it is in the " in-use " position. Good light at the tubs is essential and special care should be taken to ensure good and adequate ventilation for the removal of steam. If solid fuel is used for heating the wash boiler, the planning of the room must be controlled by the suitability of position for the flue.

Drying cupboards, when provided may be either of the fast or slow operating types ; the first requires gas or electricity for rapid heating, together with good ventilation, preferably direct to the open-air ; the slower types may be heated from a hot water coil connected to the domestic hot-water supply. It is said that to accommodate the week's laundry of an average size family, the drying cupboard needs to be about 9 sq. ft. in area and 6 ft 6 in high ; it should have a series of rust-proof rods fitted at about 3 ft 6 in above the floor and near the ceiling. If the drying cupboard is for the drying of wet clothing and not laundry the size need not be more than 2 ft 6 in by 18 in.

Sinks for laundry work should be about 27 in by 15 in by 8 in (or, the normal 30 in by 18 in by 10 in fire-clay sink) and tubs are usually 24 in long, 21 in from back to front and 15 in deep (see B.S. 1206 and B.S. 1229). Wash-boilers require an area of approximately 21 in by 21 in, and similar dimensions will accommodate some types of washing machines, but others need somewhat larger spaces (see B.S. 1183 and B.S. 1250). Wash-boilers, whether electric, gas, or for solid fuels, should be of the nominal 10-gal capacity. Figure 24 illustrates two typical utility rooms or wash-house lay-outs indicating the desired relationship of the various pieces of equipment to one another. Diagram A shows the room either as part of the house or as an out-house. The sink or tub is placed on an external wall for simplicity of services. The wash-boiler may, in either type, be replaced by a washing machine. Diagram B illustrates a type of utility room combined with or attached to the kitchen in which the sinks are placed back-to-back separated by a duct for all the plumbing services ; it should be noted that the wash-house in this type is used also for storage of brooms and similar utensils and also serves as an entrance lobby to avoid direct external access to the kitchen. A door may be introduced if complete separation of the wash-house from the kitchen is required.

Fuel Storage—The size of a fuel store should be related to the number of solid-fuel appliances likely to be in regular use in the house and also to the probable frequency of deliveries ; whilst it is admitted that delivery in large quantities is more economical and large storage reduces the need for pithead and merchant storage during the summer months, many occupiers have not been prepared to pay for large quantities at any one time, preferring to buy 1 or 2 cwts at each delivery. It is probable, however, that if more adequate storage is provided, consumers will buy in larger quantities. It is desirable that fuel stores in urban houses should hold at least 1 ton and preferably $1\frac{1}{2}$ tons, divided into two compartments to permit of two different types of fuel being stored. In rural and mining areas, the capacity should be increased to a minimum of two tons. Capacity should be based on coke, which is the bulkiest type of fuel and requires 80 cu. ft. per ton.

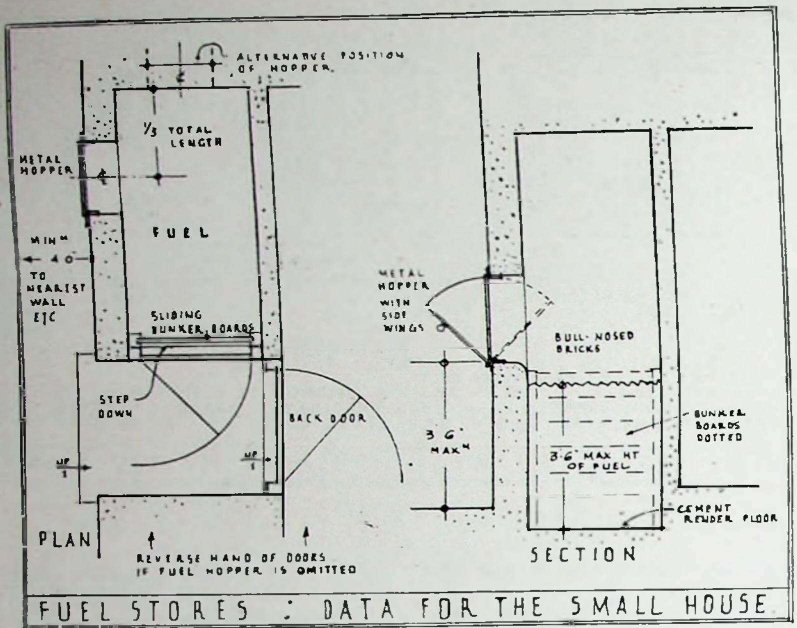


Figure 25

Coal requires about 45 cu. ft. per ton. In calculating the floor area, it should be assumed that 4 ft will be the greatest height of the stacking, as it is difficult to shoot coal or coke out of sacks to any greater height, but it is better not to depend on heights greater than 3 ft 6 in.

Fuel stores may be either within the house as part of the house with an external approach, or as a separate building or part of a group of outbuildings. In small houses there is general objection to storing fuel within the building, since it causes additional labour in cleaning; it is, therefore, preferable to adopt one of the external positions. The fuel store door should be near the "back" door, with a connection under cover whenever possible. It is preferable to avoid placing the fuel store immediately adjoining the larder, as dust tends to penetrate windows and ventilators. In some country areas provision may be needed for the storage of wood, which is much more bulky than coke, and in a few areas provision may be needed for peat.

Fuel storage in flats is a more difficult problem, as adequate space in suitable positions is seldom available. This is discussed fully in the section on "Flats." Unless constant hot-water and central heating are provided it is desirable to provide accommodation for at least 5 cwt of each of two types of fuel, but where these services are centralised a less quantity of one fuel only will probably be sufficient.

Access for delivery of fuel has already been mentioned in this section. Any entrance door through which sacks of coal must be carried should be at least 6 ft 6 in high, which should be also the minimum height of the store space itself. If delivery hatches are installed these should be about 3 ft 6 in above the ground level to the

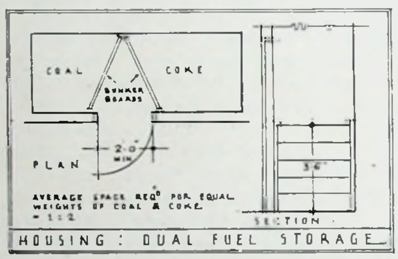


Figure 26

top of the sill, and never more than 4 ft. Delivery openings with hatch doors should be 2 ft wide and 2 ft 6 in high, and the sill should be specially strong to withstand the very hard usage to which it will be subjected. If hinged hoppers are fitted, they should be at least 1 ft 9 in square and, better, 2 ft square; there is a good commercial type of cast iron or steel wall-hopper 2 ft 10 in square overall, giving a 2 ft 6 in square opening. Hoppers should open to an angle of about 45 degrees and be provided with very strong stops or chains. The brick internal-sill should be formed of very hard bull-nosed bricks. Hoppers should be either placed on the back wall opposite the door through which the fuel is to be removed, or on a side wall near the back wall. All fuel stores should be equipped with bunker boards to ensure economical use of a given space; alternatively, removal hatches should be provided in brick partitions, the hatch being 2 ft wide by 15 in high.

It is usual to provide a small area of permanent ventilations in fuel stores near the ceiling or, alternatively, a series of holes in the door. Cross-ventilation is preferable.

Care must be taken that the enclosing structure of fuel stores is of adequate strength and the facing of the walls and floor of such materials which will withstand the impact when fuel is being delivered and the general wear and tear arising from the movement of rough hard materials. Floors should be smooth and hard, such as concrete, and it is advantageous that they should slope slightly towards the removal position, but the slope should not exceed 15 degrees, to avoid placing an unnecessary load against the bunker boards. A small area of floor adjoining the bunker boards or removal hatch should be horizontal. If a removal hatch is installed, it is desirable that the floor opening should be covered with a smooth metal surface. Figure 25 illustrates a fuel store planned adjoining the "back" door and approached under cover from the covered entrance porch; in adopting this plan it is usually difficult to accommodate more than one type of fuel. If two types of fuel are to be accommodated it is better to use a plan of the type shown in Figure 26, in which the door is planned to give a greater space at one end for the fuel having the greatest bulk per ton; by the use of coal boards planned as shown there is considerable space-saving.

Ground Floor W.C.—The desirability of providing a W.C. on the ground floor has already been discussed in this series and reference made to planning it with internal approach from the hall, as shown in Figure 10. The alternative position is with an external or covered approach from the back door, a position which has obvious disadvantages, particularly in the provision of adequate frost protection. In larger houses this W.C. is often planned in conjunction with coal storage, but it is doubtful if such an arrangement is possible in dwellings having very limited total floor areas. If a W.C. only is provided, the room need only be 2 ft 7½ in wide and 4 ft 1½ in long, but in this case the door must open outwards, which is generally an unsatisfactory arrangement. If the door is to open inwards the length should not be less than 4 ft 6 in, and even then the door must not be more than 2 ft wide. Large doors are unnecessary for W.C.s, and a width of 2 ft 3 in is sufficient for all dwellings.

When a lavatory basin and W.C. are placed in the same compartment, the width should not be less than 3 ft and the length should be increased to 5 ft 3 in unless the door is on a side wall or opens outwards. Figure 27 illustrates a combined W.C. and lavatory basin of minimum dimensions. W.C.s project from the wall at least 20 in, and are often as much as 25 in, especially if low-down water-waste preventor types are used. Basins, to be of real value, should project at least 16 in and should be 22 in in width. Corner basins, although often used to economise in space, are unsatisfactory, as adequate elbow-room is not available and are consequently unpopular.

Figure 28 illustrates the space required if W.C.s are to be placed under staircases; it will be noted that the

use of a high-level water-waste preventor in such positions is difficult, and it is therefore usually necessary to resort to the use of low-level types. It is essential that the wall against which the tank of a low-level type is placed is such that the splay of the ceiling commences not less than 4 ft high from the floor, in order to obtain sufficient height for effective flushing. It is necessary to obtain a clear height of 5 ft 3 in at the centre line of the seat, which may normally be considered to be 18 in from the back wall, and it is essential to have a clear height of at least 6 ft 6 in at a point 12 in. in front of the pan, which is approximately 32 to 36 in from the back wall.

Upper Floors—The staircase, which has already been discussed in detail, usually leads to a landing and/or corridor, giving access to all bedrooms, bathroom, W.C., linen cupboard and any general storage space. Care should be taken not to restrict the turning-space at the head of the staircase or to cause other difficulties for the handling of furniture. Landings and corridors should not be less than 2 ft

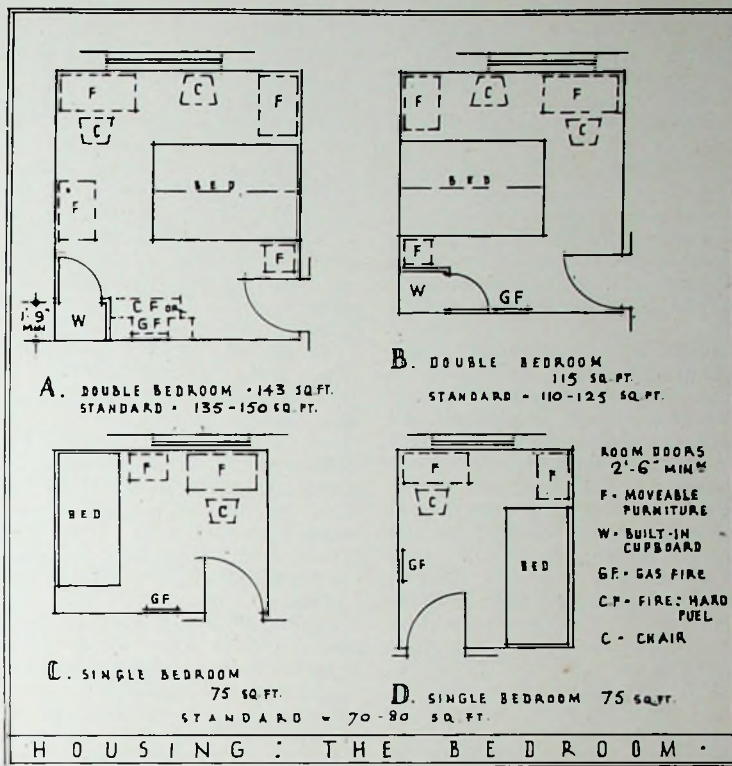


Figure 29

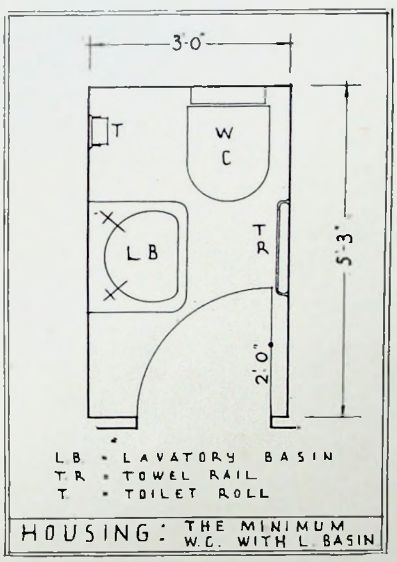


Figure 27

9 in wide and the total area should be as little as possible in houses having small total floor areas, in order to obtain the maximum floor space for the rooms. Landings and all doors to rooms should have reasonably good lighting, both by day and night, but it will be found that when semi-detached or terrace houses are planned on narrow frontages it is not always possible to provide direct daylight and the introduction of glazed fanlights over room doors may then become necessary.

Bedrooms—Bedrooms should have direct access from landings or corridors and should in no circumstances be intercommunicating. Floor areas should be :

First bedroom : At least 135, and better 150 sq. ft., allowing for two persons, together with space for a baby's cot.

Other double bedrooms : Not less than 110 sq. ft., and preferably rather more.

Single bedrooms : Not less than 70 sq. ft., and better, not less than 80 sq. ft.

These areas are usually measured inclusive of built-in cupboards and chimney-breasts.

Some authorities suggest that in the normal three-bedroom house there should be little difference in area between the two larger rooms and that the smallest room should be much larger than has been general in the past. The shapes and sizes of the rooms depend very much on the placing of the essential furniture and equipment and, particularly, the relationship of the bed to windows, door and fireplace ; to avoid the bed being in a draught and, where possible, to avoid facing the light. Figure 29 illustrates typical layouts of bedrooms based on the average of the areas given in the Housing Manual, 1944. Diagram A shows the principal double-bedroom. Diagram B is typical of double-bedrooms other than the largest bedroom, and Diagrams C and D are single bedrooms alternatively with long and short window walls for the same floor area.

Beds vary considerably in width, but for housing purposes it may generally be assumed that single beds are 2 ft 6 in wide and double beds 4 ft 6 in wide. Twin beds require at least 6 in

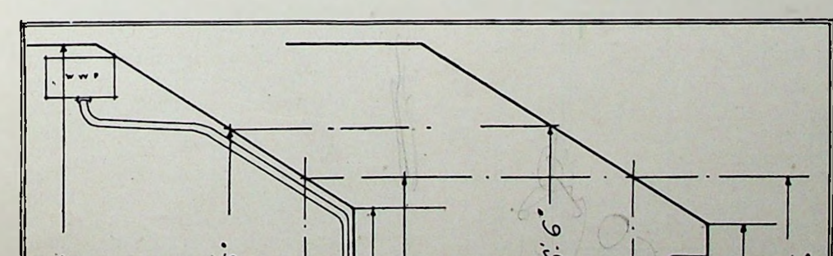


Figure 28

extra allowed, as they cannot be placed close together due to the overhang of the bedding; in fact, if a space is to be allowed in which to place a bed, an allowance of 3 in on each side of the basic bed-size is essential.

Beds are normally 6 ft 6 in. in length, although some divan-beds are slightly less. A cot is normally 4 ft 6 in by 2 ft. It is undesirable, although often unavoidable, to plan beds with the long side against a wall, as this involves moving the bed in order to "make" it.

There is a school of thought which suggests that, owing to the limitation of space in many houses, certain of the bedrooms should be planned and equipped as bed-sitting rooms. If this suggestion is to be adopted, special consideration should be given to the floor area, of which such a large proportion is generally occupied by the bed and circulation space. This dual use of rooms will probably involve different provisions in regard to heating and lighting. Bedrooms should be rectangular and not less across than the length of the bed, 6 ft 6 in plus 4 ft for passage-way and a piece of furniture, making a minimum of 10 ft 6 in. If the bed is placed sideways, 3 ft plus the same 4 ft passage space should be allowed, making a minimum of 7 ft.

Windows should be planned wherever possible on a long wall. Window areas are controlled by statutory requirements; excessive areas of window should be avoided in order to provide adequate wall space for furniture and to avoid undue heat-loss.

Sills should be kept rather higher than in living rooms, and the window heads should be as near the ceiling as the lintel or eaves permit. Statutory requirements in most districts ask that the opening should be at least 6 ft 6 in above the floor. Bedrooms need not be more than the statutory minimum height, which is 8 ft in almost all districts.

Dormer windows should be used with great discretion, as they tend to make the rooms dark over some parts of the floor area; and also, the partially sloping ceilings which accompany them are apt to create difficulties in the placing of furniture.

There seems to be very little need to provide fireplaces for solid-fuel in districts where electricity or gas are available. There is, however, a limited demand by tenants for a solid-fuel fireplace in at least one bedroom; but since fires are used in bedrooms very intermittently, types most suited to this type of operation are preferable. Much work is involved in the transport of hard fuels, cleaning and the like, and the majority of tenants now seem to prefer gas or electric fires in bedrooms. Consideration should be given to the possibility of air-heating from ground floor appliances, augmented by electricity or gas fires, or alternatively (especially in flats), by the installation of a central heating system.

Figure 29 shows positions for fires, and only in the main bedroom, Diagram A, is a solid-fuel installation suggested. The figure shows gas fires, but this is to indicate either gas or electric fires, preferably with ventilation flues of at least 30 sq. in. area. In Diagram A the fire is suggested as being planned in the spine wall, as this tends to permit of better planning than when the fire is in the party wall, but it is of necessity controlled by the ground floor planning. It should be noted that in single bedrooms of minimum size it is almost impossible to plan the bed except with a long side against a wall if adequate circulation space is to remain; it should be noted that no cupboards are shown in the single bedroom diagrams, as it is usually necessary to plan these flush with the walls, often as divisions between rooms by the adoption of flush cupboards it is possible for these single rooms to be used as bed-sitting rooms.

All bedrooms should be provided with built-in cupboards, allowing as a basis at least a 2 ft run of hanging space per person, and it is better if longer lengths of cupboard can be provided, giving partly hanging and partly shelf space. Cupboards should be 1 ft 10 in deep (1 ft 9 in. in the clear) and should be 6 ft 6 in high, with extra cupboards above reaching to the ceiling for the storage of the less frequently required articles. The provision of adequate built-in cupboards is more economical in floor-space than the provision of equivalent areas of storage in the form of loose furniture. By careful planning of cupboards, the partition between two rooms may be formed entirely of such cupboards. If the clear internal depth of the cupboards is reduced below 1 ft 9 in it is necessary to arrange hangers parallel to the front, with a consequent increase in length of the cupboard; such an arrangement provides a less convenient method of hanging.

Bathroom—As previously stated, the bathroom is generally on the bedroom floor, by the preference of many tenants; sometimes, however, it has to be planned on the ground floor, for reasons of economy of total floor-space or to suit the convenience of certain types of occupants. From the point of view of planning the bathroom is one of the most important rooms in the house; it must be well placed and should not be skimped in area; it is possible to design a bathroom, as illustrated in Figure 30, within a space of 5 ft by 5 ft 6 in, but an increase above these sizes is desirable. If, as is now generally recommended, a W.C. be placed in the bathroom, the area should be increased to at least 6 ft by 5 ft 6 in, and, again, a greater area is advantageous. Baths, for housing purposes, should be at least 5 ft 6 in long overall by 2 ft 4 in wide (see B.S. 1189). It is becoming general to use rectangular types with enclosing panels, but it is desirable that the latter should be so shaped to provide a toe space so that a mother can stand close to the bath when washing a child. Some authorities still prefer baths which are not enclosed, on the ground that the open type is more easy to keep clean and avoid harbourage of vermin.

Lavatory basins should be 25 in long by 18 in projection, preferably fixed on towel rail supports of the leg type (see B.S. 1188 and 1255). Basins should not be fixed within 9 in from a return wall if comfortable elbow-room is to be provided. It is desirable to provide a heated towel-rail if the hot-water circuit permits. Care should be taken in the planning of the bathroom window to avoid stretching across the bath to open or close the window, as this is a frequent cause of accidents. Doors to bathrooms need not be greater than 2 ft 3 in wide. Windows, if placed over the basin, should be so arranged that the internal sill level is above the back of the basin, and therefore at least 3 ft 6 in above

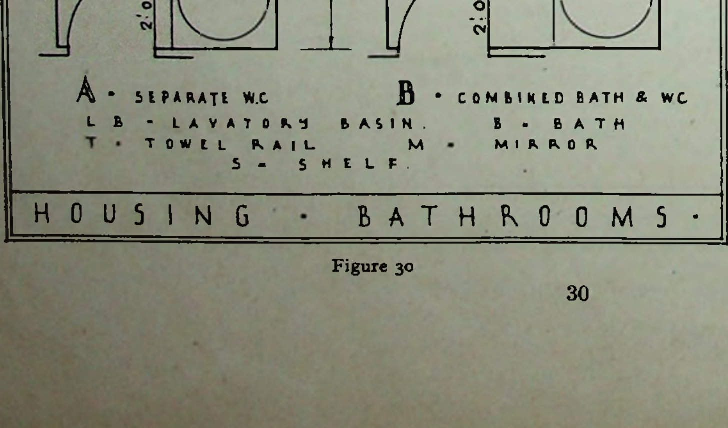


Figure 30

the floor. Wall finishes for bathrooms should be selected for imperviousness and resistance to damp by steam and water and for ease of cleaning. A 6 in tile skirting above the bath rim is a useful provision. It is preferable that the floor material should not be unduly cold.

W.C.—If the W.C. is to be planned as a separate compartment, the dimensions should follow those already given earlier for the ground floor W.C.

Linen Storage—In the past inadequate facilities for this purpose have often been provided. The placing of the store must, in a measure, be related to the pipe lay-out of the domestic hot-water system, as it should be heated, though not to any very high temperature. In many installations an unlagged and therefore wasteful hot-water storage vessel has often been placed in the linen cupboard, which may damage linen due to excessive heat and, in addition, a large proportion of the storage space is used by the vessel itself ; it is better to instal a pipe coil or small radiator as the means of heating. It is advisable also to provide a small amount of ventilation such as 6 in by 2 in panels filled with wire gauze in the top and bottom of the door. If, however, tanks or cylinders have to be planned in the linen cupboard, great care should be taken to design a sufficient space for a 30-gal storage vessel (see B.S. 417 and B.S. 699) together with space for pipe connections and for adequate lagging, for which at least 2 in on all sides is necessary. A storage vessel with normal lagging loses sufficient heat through connections, etc., to warm a linen cupboard adequately.

Linen should not be stored in bathrooms (as is so frequent), since it is impossible to prevent the penetration of steam into the cupboard. Access to the linen store should therefore be from a landing or corridor. Linen cupboards planned in bedrooms can also be inconvenient.

Shelves should be spaced about 12 to 15 in apart, and should have a depth of at least 2 ft, and are better if 2 ft 3 in deep ; this depth permits of the placing of folded articles " end on." If, however, it is impossible to obtain the depth given, the dimension should, in no instance, be less than 18 in. A shelf length of at least 3 ft should be provided in a three-bedroom house. The lowest shelf should be at skirting level to avoid dust entering under the door. Shelves should be of the slatted type, consisting of 2 in by 1 in wooden slats spaced ½ in apart ; the front and back slats being at least 1 in from the door or wall to permit of air circulation. The factors which control the shelving depth are that everything should be visible from the front, and the sizes of large sheet and blankets folded after washing, which are 1 ft 10 in by 7 in for the former and 24 in by 24 in for the latter.

Daylight from windows is unnecessary in linen cupboards unless they are very large in area ; but both natural and artificial light should shine into the cupboard when the door is open. If artificial light is provided within the cupboard it should be placed near the door so as to light adequately the whole cupboard. Figure 31 illustrates two linen cupboards of equal area. Diagram A shows a well-planned lay-out in which every article is easily accessible and the greatest advantage in storage space is obtained from the area, while Diagram B shows a usual but very uneconomical arrangement ; even if the door of Type B opens outwards no advantage is gained, as the shelves would be too deep. Pairs of doors as shown in Diagram A are better than a single centrally-placed door, since direct access is possible to the front corners of the shelves.

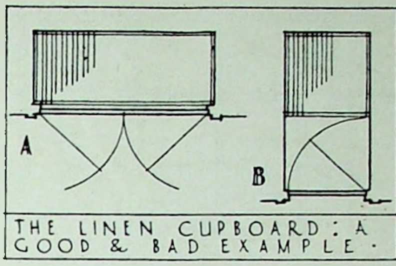


Figure 31

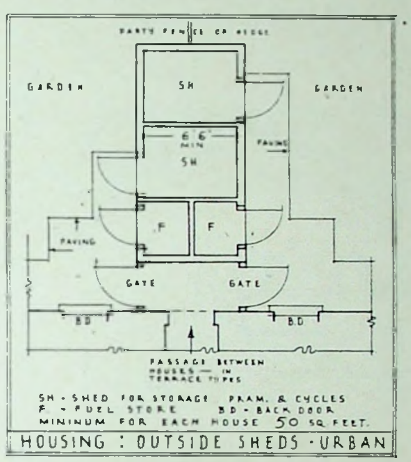


Figure 32

General Storage—It is most desirable that proper provision is made for general storage of articles which are not really needed in bedrooms, but for which some accommodation must be found in the house, as, for example, trunks and suitcases. If space can be found on the bedroom floor for a cupboard having an area of at least 15 sq. ft. it is most valuable ; in small houses, however, it is often difficult to plan such an area without undue encroachment on bedroom space. Where pitched roofs are used advantage may be taken of the roof space to provide for general storage, although this space is not generally as dry as is really desirable. If roof spaces are used, it is essential that adequate first-floor ceiling construction is designed, since unexpected heavy loading of the ceiling may result in structural damage.

When a general storage cupboard is planned, it should be equipped with strong wide shelves spaced at about 2 ft 6 in and 4 ft 6 in above the floor, with some narrow shelving at higher levels.

Access to Roof Spaces—Roof spaces are normally used for the accommodation of the cold-water supply cistern and sometimes for general storage, and fairly easy access should be provided, either by means of a ladder or a " loft-ladder " through a trap-door in the ceiling of the landing or corridor ; this access should not be planned from a bedroom. Care should be taken to ensure that the size of the access trap is sufficient to permit of the replacement of the cold-water storage cistern, which is approximately 2 ft 6 in by 2 ft by 2 ft for 50-gal capacity, and 3 ft by 2 ft 6 in by 2 ft 3 in for 80-gal capacity (see B.S. 417).

External Sheds—It has become customary to provide an outbuilding or garden shed for all houses in housing schemes. It is possible to incorporate the sheds as a planned part on the total design of an estate and so, to a large measure, avoid the occurrence of unsightly and sporadic additions erected by tenants.

In urban schemes, the shed should have a floor area of at least 50 sq. ft., but in rural areas it should be increased to at least 85 sq. ft. This store should be dry, windproof, and provide reasonable protection against frost, although complete frost protection is, of course, impossible unless heating is available. The garden shed is often grouped with the fuel stores and the wash-house, if the latter is planned as an external unit ; it may be necessary, although undesirable, to include the second W.C. in this group. Figure 32 illustrates a typical grouping together of the outbuildings for a pair of houses of an urban type on narrow frontages The group comprises two sheds and two fuel stores placed on the line of the party fence, and so arranged that the approaches to each owners' sheds are separated and each property cut off from the common entrance by its own gate.

Sheds should be at least 6 ft 6 in across in order to accommodate a bicycle. Paving at least 3 ft wide should lead to every door, and this should be extended to provide a dry area near the back foor. Sheds should be at least 6 ft 6 in high to the lowest part of the roof. Doors should be at least 2 ft 6 in wide to allow for the entrance of a garden barrow.

Figure 33 illustrates types of outbuildings primarily applicable to rural schemes designed on wide frontage sites, but these would be equally applicable to urban houses where site conditions permit of their use as alternatives to the lay-out shown in Figure 32.

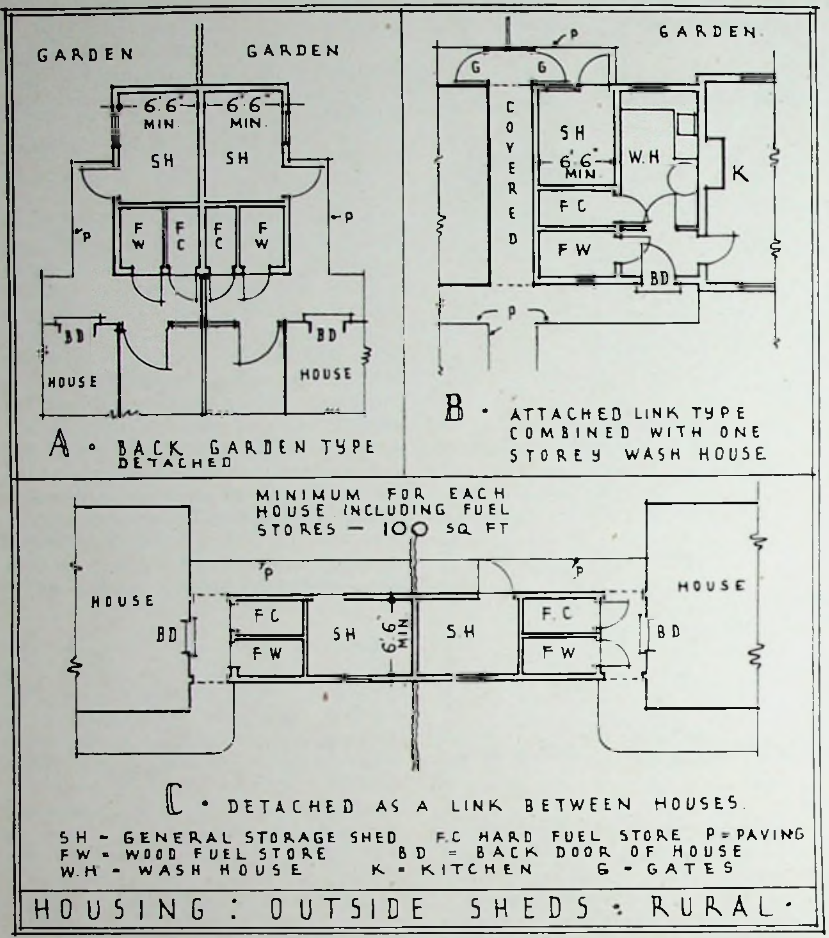


Figure 33

In each type shown in the diagrams of Figure 33 the minimum area for the combined store shed and fuel stores is 100 sq. ft. This area must be increased if a wash-house is to be incorporated in the group. Diagram A shows a detached type planned in the back garden in a somewhat similar position to that shown in Figure 32, but the houses are planned sufficiently far apart that the end wall of the houses and the outside walls of the combined outbuildings are approximately lined-up, thus avoiding the need for the kitchen to look out directly on to the end wall of the outbuildings. By placing the sheds of each house side by side (unlike Figure 32) more fuel space can be provided and separate approaches with back-gates from the road can be planned, thus eliminating the necessity for a narrow covered passage-way.

Diagram B illustrates a type in which the outbuildings are grouped with a wash-house and the whole attached to the house as a single-storey link between two houses ; it is necessary with this plan to provide access to the back garden which, for appearances, may be included under the roof as a covered way, giving access to separate gateways to each garden. The plan shown has the second entrance or " back door " on the main frontage leading into a lobby, from which the kitchen, wash-house and fuel store are approached. The fuel storage is by this means accessible internally, but it is so planned as not to cause unnecessary dirt in the house itself. The lobby also forms a cut-off or ventilation lobby between the wash-house and the kitchen. The shed is directly approached from the garden with which it is most used.

Diagram C uses the outbuildings and, if required, the wash-houses also, as a connecting link between the houses ; out-buildings are detached but may be arranged to provide continuous wall and roof between the houses with gateways leading to the " back doors " and gardens. Such a plan gives narrow economical spans for the roofs of the outbuildings. It should be noted that in all the diagrams, paving is provided to give dry access to the doorways of all out-buildings.

Garages—Consideration must be given to the provision of garage facilities in housing schemes. An increasing number of occupiers, even in quite low income groups, own motor vehicles, either small cars or motor cycles and consequently need dry accommodation for safe keeping within easy access of their houses. The motor cycle does not present so great a problem as it may be stored in the garden shed unless it is fitted with a sidecar. Figure 34 illustrates the essential dimensions needed for garages to house all but the largest types of motor car. It is desirable to provide an internal length of 16 ft and a width of at least 8 ft to permit of access around the vehicle ; such dimensions do not permit of benches, and only a limited amount of shelving can be installed, which must be placed above normal head-height. A batten fixed on the floor is useful to prevent over-running when driving into the garage. It is desirable that a window is provided, the position of which is dependent on the proximity of the adjoining buildings, but should be so placed that it lights the part of the garage away from the doors. Where electricity is available a lighting point should be installed in a position approximating that shown in the diagram, together with a power plug. Doors, when opening outwards, are better in four folds rather than as a pair, since they occupy when open, less space ; when sliding inside types are used, they must of necessity be in narrow widths. There should be a slight fall on the paving at the entrance to lead water away from the garage floor, which itself should be level.

In larger houses and where the site frontages permit, garages may be associated with the individual house, either as a separate building or attached to or forming part of the house itself. When a chauffeur is employed, garages may with advantage be at some distance from the house, especially if living quarters are attached or planned over the garage, but when the vehicles are owner-driven, as is general in all lower and middle income groups, the garage should be close to the house and, if possible, it should be in close proximity to an entrance. By the use of an attached garage additional bedroom floor area may be provided, if needed, by building over the garage ; if, however, rooms are to be built over the garage, a fire-resisting floor, and, if possible, a floor resistant also to petrol fumes, is essential. If the garage is incorporated within the walls of the house, no direct communication is allowed in most districts, but it is sometimes possible to arrange a ventilated lobby between the garage and the house proper. Great care must be taken in all circumstances to reduce fire risks due to petrol storage. Detached garages should have a roof which will delay fire if they are planned near houses. Ventilation should be provided in all garages at a low level to remove heavy fumes, in addition to high-level ventilators for general ventilation of the space.

Figure 35 illustrates typical positions of garages in relation to houses. From the figure it will be noted that no access is available to the " back " door if the house and garage occupy the full frontage width and the garage is on the same frontage line as the house, and therefore it is essential to provide frontage widths equal to the

combined width of the house, the garage and a path. Alternatives are either to set back the garage behind the "back" door when no through access is possible to the back garden except through the garage or through the house, or to set back the garage itself behind the back wall of the house sufficiently to provide access to the "back" door when this is on the back wall.

Garages need a paved wash-space which is generally planned in front of the garage, but if space permits and a second set of doors are provided, this may be placed in a less conspicuous position behind the garage. This paved space should be at least 16 ft long and not less than 8 ft wide. It should be of concrete laid to fall to a gulley which is best placed centrally and thus under the vehicle being washed. A supply of water with a hose connection is desirable, and should be placed inside the garage as a protection against frost. Gateways and approach roadways should be at least 7 ft 6 in wide and are better if slightly wider.

On narrow sites straight approaches are almost essential, as the minimum turning radius for the average car is 20 ft to the outside of the roadway. Care should be taken properly to construct and drain drive-ways leading to garages to avoid maintenance costs.

For small houses and particularly those on narrow-frontage sites, garages may have to be planned in groups scattered through the housing scheme as a whole, so that the vehicles are housed not too far from the homes of the owners, and use can be made of individual and grouped garages as connecting links between groups of houses or on corner sites.

Figure 36 illustrates two alternative positions of groups of garages. Diagram A has these placed on a cross-road connecting two roads on to which houses face, whereas Diagram B shows a scheme based on the use of an internal site with its own approach or approaches from traffic roads. The dimensions of such garages should be as given in Figure 34, but the forecourt or washing space should not be less than 18 ft to provide reasonably easy access to the garages. Where more than five or six garages are placed in a row, the footway should be continued across the frontage, and the cross-over limited to a single width of 10 ft or a similar width at each end. In the scheme shown in Diagram B, if there are a large number of garages it is advantageous to have alternative entrances and exits. The approach roadway should not be less than 10 ft wide, but 16 ft should be the minimum width if traffic has to use the same road for entrance and exit to the garage block, and also if the drive-in is of a greater length than 100 ft from the main road. When garages are placed on both sides of a central space, this should be not less than 20 ft wide. A type shown in Diagram B has the advantage that it is generally screened from the roads. It is desirable that

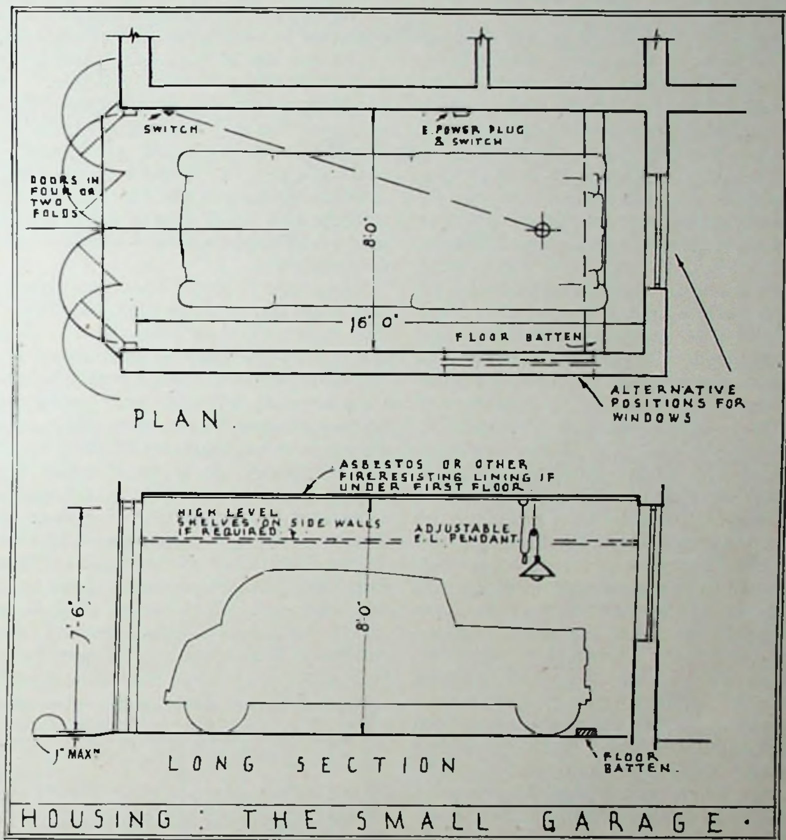


Figure 34

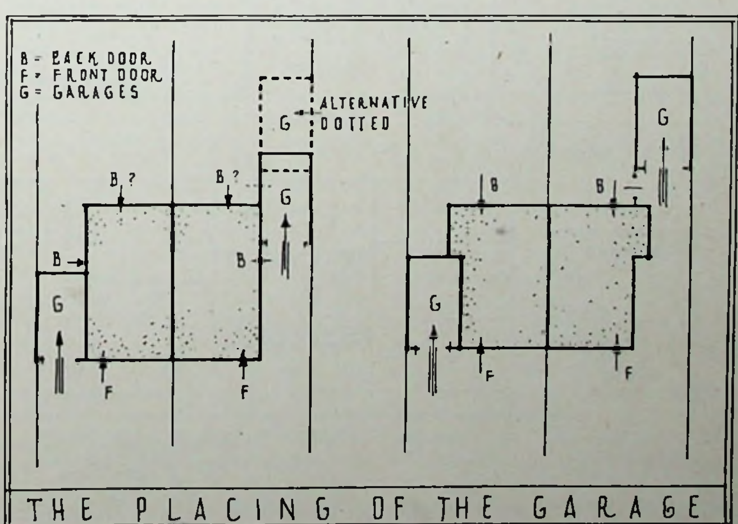


Figure 35

facilities are provided for a water supply and that the forecourt spaces are paved and have adequate and proper drainage.

The Section—The type of roof influences the house section considerably especially in regard to the span of the building. The selection of the type and the material for its covering is largely a matter of personal choice of the designer, although it is also governed by cost ; if flat roofs are used careful thought must be given to a number of problems which are more easily solved by the use of piched roofs, such as placing of cold water cisterns, pipe and conduit runs. A pitched roof space provides an appreciable amount of insulation against heat and cold, assuming that a reasonably good roof construction is adopted, also a useful storage space is available for little cost. Pipes, conduits and cisterns may be

installed more conveniently and remain easy of access, whereas when flat roofs are used, these service pipes often have to be embedded in the roof construction and the cisterns placed above the roof, thus presenting an increased problem of insulation against frost as well as a more difficult aesthetic problem. Many designers place cold water cisterns below the roof level in order to avoid difficulties of design of houses with flat roofs, but such positions tend to be unsatisfactory, if sanitary fittings or water heaters are installed on the upper floor, owing to insufficient head of water.

Figure 37 illustrates seven alternative sections of a house by which comparisons of heights, cubic contents and amounts of usable space can be noted. The minimum floor heights are dictated by local by-laws, being generally 8 ft, but in some instances 8 ft 6 in for ground floors. If rooms are placed partially in roofs as in Diagram A, the by-laws require a vertical wall height of at least 5 ft, although some areas admit 4 ft 6 in. Also a flat ceiling area at full normal ceiling height of at least half the area of each habitable room is required. Diagram A shows a method of reducing the cubic contents to the minimum in a two-storey building ; this method consists of pitching the roof 5 ft above the floor level of the upper storey, and using dormer windows. It may be found that such a design, whilst reducing the cubic content, has little effect on the total cost owing to labour and materials involved in the construction of dormer windows. If casement dormer windows are used care must be taken to place them so as not to interfere with the continuity of the rain-water gutters when the sashes are open ; if the gutter is stopped between the windows much extra cost is involved in the provision of down pipes for each section. The dormer windows are placed in Type A so that the ceiling level is maintained ; if the window head level is reduced, the by-laws in some districts require the top of the opening portion of the window to be at least 6 ft 6 in above the floor level ; the amount of unused space is small and only of value for tanks or storage. In detached, semi-detached or end units of blocks of houses, dormer windows may, to some extent, be avoided by the placing of windows in gable ends.

Diagram B has a much larger cubic content than Diagram A, but the cost is likely to be about the same owing to the extra cost of dormer windows counteracting the cost of the extra height of the outside walls. Generally, however, this type of section is more straightforward from the constructional viewpoint and consequently tends to be more economic. The type shown in Diagram B provides more space in the roof, but it is usable only as storage. It should be noted that to comply with most by-laws the windows of upper floors not partially "in the roof" must be 7 ft above the floor. This example permits of all the walls of the rooms to be vertical to their full height, which is not possible in Type A ; if the walls are not vertical for the full height, it is usually more difficult to place furniture or plan built-in fittings properly within the rooms.

Diagrams C and D show the roof space used for rooms which, under some by-laws, may necessitate the use of thicker walls on the ground floor. In Example C more floor space is available than in Type D by the use of sloping ceilings with vertical walls placed where a height of 5 ft becomes available. If the walls are so placed as to give vertical heights equal to the full floor to ceiling heights of the rooms there is a loss of floor space amounting to about 25 per cent, although the space thus lost may be used for storage and cupboards. The cubic content of Types C and D are the same, and, in spite of the space gained, this figure is not much greater than that for Type B, and the additional cost of providing the extra habitable space is usually fairly economical.

Diagrams E and F show examples of the mansard type of roof. In Type E the upper floor is reduced by about one-fith of the ground floor area. It is desirable when mansard roofs are used to place the vertical wall under the plate carrying the upper pitch, thus giving vertical walls for the full height of the rooms. In Type F equal floor areas on the ground and first floors are obtained by projecting the floor, at first floor level, a considerable distance beyond the face of the ground floor, but this tends to give an unpleasant elevation and to influence unduly the good lighting of the ground floor rooms. The height need not be increased very much to allow sufficient space for a room on the second floor, but the cost of so doing is very considerably greater due to the heavier structural work necessary.

Diagram G illustrates a type with a flat roof in which the cubic contents are less than Type B, but in which the cost may be the same or even greater.

In domestic work, the cubic contents of a building do not bear any absolute relationship to the cost, although it is a useful guide if proper consideration is given to the various amounts of work put into any given cubic space ; nor is the cost based on the rate per superficial foot of floor space always a constant figure ; it is likely to be affected just as much as the cost per cubic foot due to many varying factors arising in different schemes. From Diagrams B and C it can be noted that the cubic contents vary little, although the amount of work in Type C is undoubtedly greater than that in Type B.

Structural Standards—There are a number of structural factors and building components which, although not strictly matters of planning, have much influence on the plan and the work of the architect when designing dwellings ; it is therefore proposed to give a number of short references to some of the subjects which may have direct effect on planning.

Consideration should be given to the improvement of thermal insulation for houses to reduce heat losses, which have been unnecessarily high in many forms of construction used in the past. Increased sound insulation, especially in regard to party walls, should also be

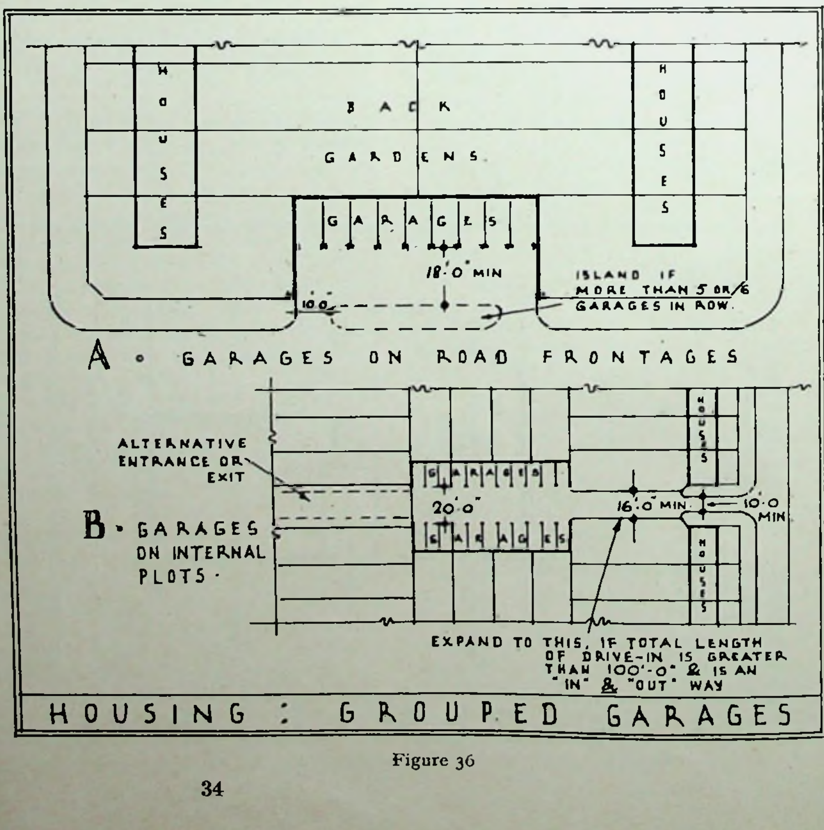


Figure 36

given careful study. Maintenance, which tends to be very costly, should be borne in mind constantly during the designing and in the selection of methods of construction, materials and finishes. Very much helpful information on improvements and economies in structural design is given in the "Housing Manual, 1944," together with its Technical Appendices and also in the report "House Construction," Post-War Building Studies No. 1 (H.M.S.O., price 2s. 6d.).

Doors—Doors should be hung to screen rooms but also so that they do not incommode the use of the room. Main rooms should have doors at least 2 ft 6 in wide, but a slight increase for living room doors and doors to kitchens is advantageous. Doors to bathrooms, W.C.s, stores and the like may be reduced to 2 ft 3 in or even 2 ft wide. A height of 6 ft 6 in should be provided for all internal doors to rooms, but greater heights are unnecessary (see B.S. 459). If large openings are provided between rooms these may be fitted either with pairs of doors or folding screens ; sliding doors usually should be avoided, as they require either a recess into which to slide when open or need too much wall space ; it is better to avoid the use of pairs of doors with leaves greater in width than 3 ft due to the strain on the hanging edge and to the difficulty of providing space to fold back the doors when open. Sliding doors for normal-sized openings may save space, but are undesirable owing to heavier maintenance and the risk of catching fingers between the door and the closing frame.

There are two main internal door types, panel and flush ; it is probable that the former will remain less expensive to install but the latter are more easily cleaned, although tending to show surface damage more readily.

Windows—The merits of the various types of window are largely matters of personal preference. British Standards are available for both wood and steel windows in a wide variety of types (see B.S. 644, parts 1 and 2 and 990). Local by-laws fix a minimum area of window in relation to the floor area of rooms and lay down a proportion of the window which must be made to open ; it is doubtful if there is any scientific basis behind these requirements, which are usually one-tenth of the floor area, of which half must be capable of opening, but it is a basis which is simple in application from the point of view of the designer and for administration of the by-laws, and has not, on the whole, proved to be inadequate. Full information on desirable window areas from a more scientific aspect is given in the Report," Lighting of Buildings," Post-War Building Studies No. 12 (H.M.S.O., price 2s. 6d.) Window areas must be weighed carefully against heat losses unless inexpensive forms of double-glazing become generally available.

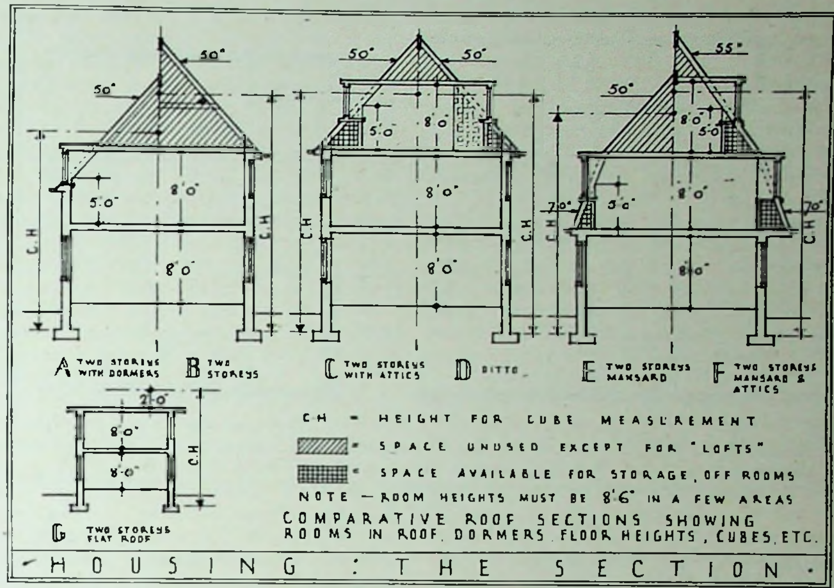


Figure 37

In choosing window types careful consideration should be given to the means of installing curtains and, in fact, it would seem wise for housing authorities to provide some equipment for the avoidance of damage which often arises from the fixing of fittings by tenants. It is difficult to fix curtains to inward-opening types of window satisfactorily. It is relatively easy to fix curtain rods or tracks to wood-framed windows, but consideration should also be given to the making of adequate provision for curtain fixings in lintels, especially when these are of concrete (see B.S. 1239), as it is undesirable that curtains, excepting lace or net, be hung close to the glass surface.

A recent development in both wood and steel casement-type windows is the introduction of the sub-light types having a fixed portion adjoining the window-board below the opening sashes ; this fixed portion allows articles to be placed on window-boards without risk of being knocked out of the window when open ; this type is particularly useful for the upper floors of blocks or flats.

In high blocks of flats windows should be glazed from the inside, and where windows open on to access balconies, inward opening or double-hung types should be used to avoid obstructing the gangways. Very special consideration should be given to the selection of windows for exposed or seaside sites, as the normal sections both in wood and metal are apt to be unsatisfactory.

It has frequently been suggested by some authorities that something greater than the usual standard of 10 per cent of the floor area of each room should be allowed for the area of windows, and the figure has been put as high as 20 per cent and even higher. If areas such as these are considered necessary, the following table shows the window area required

WINDOW AREA

Area of Room *sq. ft.*	*At* 20 *per cent* *sq. ft.*	*Length at 4ft high* *ft in*	*Length at 5ft high* *ft in*
65	13	3 3	2 7
70	14	3 6	2 9½
80	16	4 0	3 2½
90	18	4 6	3 7½
100	20	5 0	4 0
110	22	5 6	4 5
120	24	6 0	4 9½
130	26	6 6	5 2½
140	28	7 0	5 7½
150	30	7 6	6 0
160	32	8 0	6 5
170	34	8 6	6 9½
180	36	9 0	7 2½
190	38	9 6	7 7½
200	40	10 0	8 0

for various floor areas, and also the necessary lengths when the windows are 4 ft and 5 ft high between glass lines ; for example, a bedroom 14 ft by 11 ft would require about 7 ft 9 in run of window 4 ft high, which is approximately two-thirds of the total length of the window wall. Such large windows limit considerably the possible arrangements of furniture within the rooms. Generally windows should reach as near to ceilings as possible, allowing for curtain fixings and pelmets, and tall narrow windows give better lighting than long low windows of equal area.

Figure 38 illustrates some points in regard to common maximum heights of glass lines above floor levels, namely, 2 ft 2 in on ground floors and 2 ft 9 in on bedroom floors. These heights enable seated persons to see out easily ; windows may be brought down to

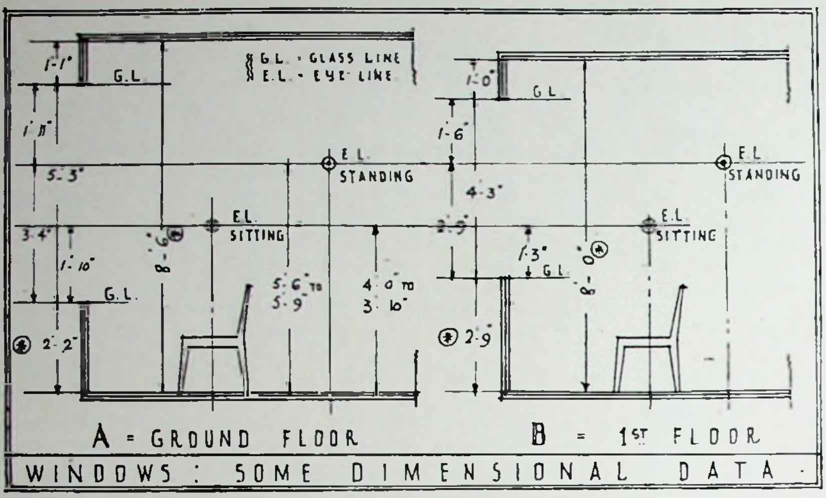


Figure 38

skirting height in ground floor rooms overlooking gardens. The figure shows that the eye-level of the average person when seated is about 3 ft 10 in to 4 ft above the floor, and from 5 ft 6 in to 5 ft 9 in when standing. Care should be taken to avoid the frequent fault of placing the transome dividing top-hung from side-hung sashes, so that this eye-level is interrupted. The figure also shows the approximate amount of glass height available in rooms of normal heights ; this is arrived at by allowing about 12 or 13 in between the top glass line and the ceiling, in which space has to be placed the sash and frame of the window, together with the lintel. Some top-hung lights in windows seem to be a popular feature, and by their introduction it is probably easier to ventilate the room in hot or wet weather, though the same points are equally true in regard to double-hung sash windows.

Cooking, Heating and Hot Water—Frequent references have been made throughout this section to types of appliances ; it cannot be stressed too greatly that fuel appliances have a very important influence on planning, and types of appliance suitable for one plan are quite misplaced in other forms of plan.

Local conditions, such as proximity to mines, local customs and relative prices of fuels, influence the type of appliances preferred in any particular district. Generally the fuels used are inter-related and it is difficult to consider the use of each separately in any dwelling. The whole subject is discussed in the " Housing Manual, 1944," particluarly in Appendix F thereof, in the Report " Heating and Ventilation of Dwellings " (Post-War Building Series, No. 19, H.M.S.O., price 2s. 6d.) and in the Report on " Domestic Fuel Policy " (H.M.S.O., price 1s.).

It is now essential that constant hot-water is provided in all dwellings to the sink, bath and wash basin, whenever an adequate supply of water permits, which is general, except in very isolated rural areas. Hot-water supply by means of a copper must now be considered as obsolete. In houses it is undoubtedly most economical to use solid fuel for water heating, except in dwellings having very small accommodation, although it is often desirable to install alternative appliances for auxiliary and summer use. Water heating and cooking are often combined when solid fuel is used for cooking ; water heating is also combined with the living room heating in many dwellings by the use of a back-boiler to an open fire or, better, an openable stove. The use of the small independent boiler has greatly increased where a fuel other than solid fuel is used for cooking, but it is as yet uncertain whether this appliance is sufficiently economical for use in housing for the lowest income groups, with the addition of a fire in the living room. In the past hot-water services have often been very inadequate, both in regard to quantity and temperature, while the fuel consumption has often been very high in relation to the result. The storage vessel, whether a cylinder or tank, should provide for a minimum of 30 gallons. It is very desirable that indirect systems are used, especially in hard-water districts and where towel rails or radiators are required ; any additional first cost is likely to be offset quickly by maintenance costs. Full consideration should also be given to the installation of adequate quantities of thermal insulation on pipes and on storage vessels to reduce thermal losses. Very considerable development in types of appliances is now taking place which should lead to more efficient use of fuels ; the appliances may be greater in first cost, but this should be very quickly offset by reduced running costs, increased efficiency and, in the case of solid fuel appliances, reduced smoke emission and by less work for the housewife.

Cold-Water Services—Although in many areas it has been customary to serve many fittings directly from the main it is desirable that a cold water storage cistern, having a capacity of at least 50 gallons, should be installed from which to feed all cold-water outlets, except one directly off the main, for drinking water, which is usually placed over the sink ; a cistern ensures even pressure and a storage supply should the main supply fail temporarily. The cistern, together with all cold service pipes, should be planned to avoid risk of damage by frost, and where exposed (as in roof spaces) they should be protected ; this is simple to achieve and the cost small in comparison to the costs so frequently incurred in maintenance.

Garbage—This remains a problem which has by no means been solved satisfactorily, especially in housing schemes of a spread-out nature. The dust-bin remains as the only practical solution, and this should be considered more carefully than has often been the case in the past, when many have been too flimsy to withstand the constant and very rough wear to which they must of necessity be subjected (see B.S. 792). The placing of the dust-bin should be given proper attention as part of the planning of the out-works of houses.

Site Planning—The authors are of the opinion that site planning, since it must of necessity include much which is not housing alone, is outside the scope of this section. The following short paragraphs, however, draw special attention to some matters which, although site planning, are also very closely related to the planning of the dwellings themselves.

Playground Spaces—It is very desirable that suitable spaces in close proximity to dwellings should be set aside as playgrounds to eliminate the need for children to play in the streets. Playgrounds may, with advantage, be of irregular shapes. Sites should be such that the need to cross main roads to reach the playgrounds is avoided. Information on the planning of playgrounds is given in the section on " Recreation."

Trees and Shrubs—The value of tree and shrub planting to assist the setting of an estate is often overlooked. The cost in relation to the effect obtained, after a few years of growth, is relatively small. Trees and shrubs may be planted either in groups or singly in rows in the verges or in the forecourts. Expert advice should be sought in regard to the varieties to be planted to avoid those which grow too large and cannot be pruned satisfactorily, and also to ensure varieties suitable to the local soil conditions. Planting serves not only for pleasant appearance, an aid to privacy, and as wind protection, but is also a useful contribution to the reduction of traffic noises.

Full use should be made of all existing trees on sites, so long as they

are not of an age or type likely to be dangerous to closely-adjoining buildings. Equally, use should be made of existing hedges when these are in a condition which will permit of their being trimmed and, if necessary, gaps filled with a good expectation of development into a satisfactory hedge at not too great an expense. The use of existing trees and hedges tends to remove more quickly the feeling of newness on an estate and reduces the period of waiting for new planting to grow up.

Gates, Fences and Forecourts—The development of the space between houses and the public footpath is somewhat controversial ; it may either be used as a private front garden separately fenced and maintained by the individual householder, as a single communal garden maintained as a complete unit or as one unfenced space in which each householder has a flower-bed adjoining his house, but the remainder is communal usually in the form of grass, with tree and shrub planting as needed. Private gardens tend to give an untidy appearance to an estate even if well looked after (which is not always so) due to the varied treatment of the space allotted to each tenant, whereas communal gardens are likely to be more homogeneously designed and are maintained as a whole.

Dwarf walls, fences or hedges should be used, if private gardens are adopted, in preference to high fences, although these do not prevent children or dogs from entering gardens ; low walls are apt to be attractive playgrounds for children unless backed by hedges or are designed with rounded or shaped tops. When communal gardens are used it is essential that they are maintained by the estate or local authority. It is quite usual to find the front garden used for flower growing and the back garden devoted almost entirely to vegetable production. Back gardens should be separated by fences which should be of a type which dogs cannot get through or over ; hedges, after a few years take away too much of the fertility from the parts of the gardens adjoining them, but if they are used, it is essential during the period of growth to provide some form of temporary fencing such as concrete posts and wire mesh ; horizontal wires between posts alone are of little value in restricting either children or animals.

It is customary in many areas to provide an 8 to 10 ft length of wall or close-boarded fence about 6 ft high from the line of the rear of the house and also between houses where side entrances are planned in order to give additional privacy to the back of the house. Paths in gardens should not be less than 3 ft wide and it is desirable that the width be increased adjoining back entrances to provide a small dry-paved area of about 150 sq. ft.

It is advantageous to provide a path for a considerable length of the back garden for access to the " clothes line," as this has frequently been the source of much complaint. Care must be taken that all paths have sufficient cross-fall to ensure drainage.

Corner Plots—One of the most important and yet difficult problems to handle in the planning of housing schemes is the treatment of the junction of one street with another. Figure 39 illustrates six typical methods of planning road corners ; these are divided into two basic types, firstly where no connecting links such as garden walls, sheds or garages are used, and secondly, where such links are introduced as a means of building up the corner. The first type will always appear disjointed, and there is always a through view which is so often far from pleasant and even very unattractive, whereas in the second type the through view may be controlled or eliminated. Diagram A shows a treatment which provides a series of sites which are small and of irregular shapes, especially the two at the corner itself, and are difficult to handle as gardens ; this type gives a full view of the back gardens. Diagram B also gives very bad site shapes and it is extremely difficult to design the massing of the blocks, whatever roof treatment is used. Diagram C shows a type in which the through views are particularly bad, but the site shapes are better and regular. Diagram D shows a layout in which each house site is of an adequate size and a useable shape ; the connection of the houses is made by planning two garages at the corner and linking these to the houses with walls, giving a built-up corner effect. Diagram E shows a treatment in which the corner is cut off and possibly gives a little better view to drivers of vehicles approaching the corner ; in this type the corner plots are, however, a little small. Diagram F shows a development of the treatment shown in Diagram C, in which sheds and garden walls are used as the link to prevent the through view of the backs of the houses and the gardens of the two blocks. All the diagrams show how the public footpaths may be treated, and Types D and E incorporate some planting or grassed plots which should be mainsained by the local authority as part of the roadway. Sheds may be subttituted for garages in Type D, and garages instead of sheds in Type F, but Type E does not lend itself to a satisfactory application of garages for the sheds which are shown.

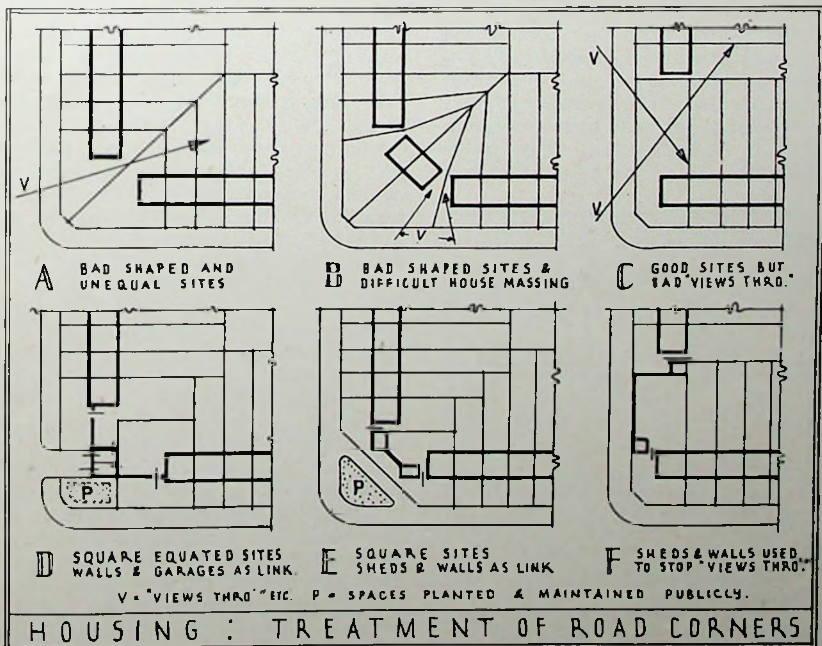


Figure 39

Roads and Paths—Roads should not be less than 14 ft wide, so that two vehicles may pass easily. Normal estate roads should be 16 ft wide, but if they are long or likely to have a considerable amount of traffic the carriage-way should be 22 ft wide. Turning spaces at the ends of culs-de-sac should not be less than 40 ft diameter. The planning of narrow estate roads with " lay-by " lengths of greater width to permit of vehicles to pass one another are not very satisfactory in practice ; lengths of widened carriage-way in which cars may be parked are, however, very useful, and such increased widths should be 6 ft 6 in, and should be in lengths which are approximately multiples of 12 ft, with a minimum of 24 ft, as effective length is lost at each end of the space. Footpaths should be at least 5 ft wide except in short culs-de-sac or quadrangles, where they may be reduced to 4 ft wide. If grass verges are to be used, widths of less than 6 ft should be avoided, as the

grass becomes so damaged that it is impossible to maintain in an orderly condition ; care should be taken to provide sufficient number of paved crossings. Verges of less width should be paved, avoiding materials strongly contrasting with that of the paving of the footpath itself.

Duplex Planning—This term is used to describe a two-storey building which is designed for immediate use as two flats, with the ultimate aim of converting the total accommodation to a single house at some future time. This form of planning, except possibly as a very exceptional emergency measure, is quite unjustifiable on many grounds ; firstly, it is quite unlikely that the conversion will ever be made if the two flats are satisfactory as flats ; secondly, if the plan provides two satisfactory flats the area is likely to be excessive for a single dwelling ; and thirdly, the rental for the house will probably be less than the combined return on the two flats after considerable cost has been expended in the conversion. It is very difficult, if not impossible, to design a building which is really adequate as two flats, as they are likely to be of a makeshift nature if the design is based, as it must be, on providing a good house after conversion. It is undoubtedly much better to assume that in all districts there will always be a demand for a number of small flats or even " flatted dwellings " from which tenants may move if they outgrow the available space and be replaced with other tenants ; on this assumption blocks of small, properly-designed flats should be built from the commencement of the scheme.

Undoubtedly the most important objection is the one first named above, namely, that the conversion is most unlikely to take place, as the cost and trouble involved will seem too great to warrant the change, and the ultimate result is that two not altogether unsatisfactory dwellings will remain for the duration of the life of the building.

Flatted Dwellings—This description applies to small blocks of two-storey flats similar in appearance to semi-detached or blocks of four houses. This type of dwelling has been much used and appears to be very popular in Scotland, but it does not appear to have been so much used elsewhere. Each dwelling, unlike blocks of flats, usually has its own independent entrance from the street. It is more or less a compromise between houses and larger blocks of flats, and has few of the advantages of houses and some of the disadvantages of flats. The floor areas needed tend to be larger than for houses providing similar accommodation owing to the need to increase the area devoted to access. The construction has to be similar to that adopted for flats, especially in regard to sound-deadening between the two storeys ; thus the cost is likely to be greater than for houses, offsetting any advantages otherwise gained.

The general planning and the relationship of rooms should be similar to those adopted for flats, and special consideration given to the sharing of garden space equally between each occupation. Fuel facilities for upper floor dwellings should be within the house and not in the garden. As in flats and bungalows, living rooms and kitchens should be grouped together, with the bedrooms forming another group ; since a combined bathroom and W.C. is usual it should be conveniently planned for use with both groups of accommodation.

Bungalows—The possible use of single-storey construction has already been mentioned, and there a number of householders who like this form of dwelling. It is a type which can only be justified where land costs are low, as in rural areas. The planning of bungalows needs very careful thought in order that separate groups of accommodation are allocated for day and night use so that the living rooms and kitchen should form one part of the plan and the bedrooms another. Living rooms should not be used for direct access to bedrooms ; bathrooms should be associated with the bedroom group, but it is desirable that they are so placed as not to be too difficult of access for the day accommodation. It has always been questionable whether bungalow forms of construction are economical owing to the relatively large amounts of external wall, roof and foundations.

Figure 40 shows a diagrammatic analysis of bungalow planning and makes clear the relationship of the various parts to one another. The front door should give easy access to the rooms used in daytime and, as far as possible, the rooms for night use should be grouped round a corridor or hall space leading from the main entrance hall and screened from the entrance itself. Otherwise the relationship of rooms should be similar to that normally adopted for a two-storey house. This figure shows the analysis of two different types of accommodation, the one, Diagram A, based on the use of a dining-kitchen, the other, Diagram B, based on a dining room in addition to the living room, or a dining recess as part of the living room, with the kitchen as an independent room. In both diagrams the living rooms, kitchens and larders are grouped together with the bathrooms and W.C. (which may be combined or separate according to the size of the dwelling) between this group and the bedroom group. There is a further point in relating the kitchen and bathroom in order to keep hot-water services and drainage together.

Accommodation for Old Persons—In the past little special accommodation was designed for old people except in the form of almshouses, but there is most certainly a considerable demand, which is likely to increase in the future, for more specialised planning for this purpose. Such special accommodation eliminates the need for old people to live with relations or friends and provides a home of their own. Old persons should not be segregated but should be provided for in general housing estates, so that they are near their friends. The special houses may take either the form of a group of houses in an estate, with possibly a communal room and accommodation for a nurse to look after the more feeble or sick, or alternatively the houses may be scattered through the estate as small groups, or even single dwellings on the ends of larger blocks.

It is preferable that the siting is near public transport and not very far from shops. Sites should also be chosen with good aspects, and whenever possible a pleasant prospect, as old people are more tied to their dwellings.

The groups of accommodation may take various forms such as bungalows, flatted dwellings or two-storey blocks of flats, the upper level of which is approached from an open-air balcony. It is undesirable that buildings of more than two storeys are used unless very easily operated types of lifts are installed. The accommodation should always be based on occupation by a married couple, although at times it

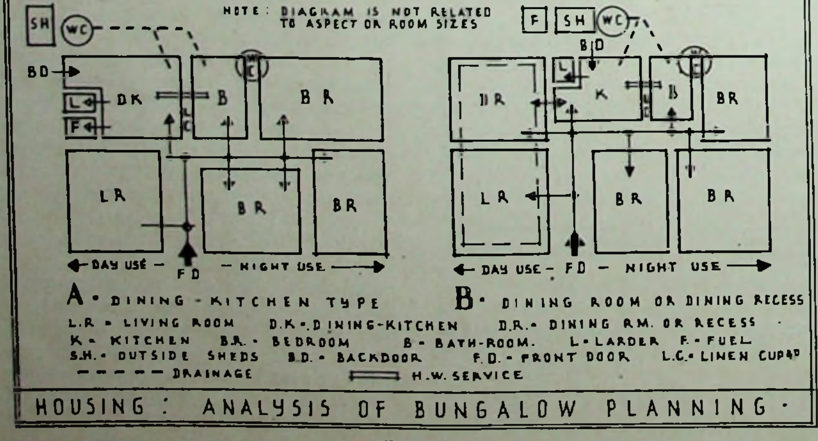


Figure 40

may be occupied by a single or widowed person. The provision of one bedroom is usual, but consideration should be given to some dwellings with two bedrooms, which permit of a visitor and is useful in case of sickness. The essence of planning for old people should be simplicity in operation with the minimum of work and effort and operation at minimum cost.

The minimum accommodation should be a living room of at least 140 sq. ft., a double bedroom of at least 120 sq. ft., a small working kitchen or kitchen facilities in space additional to that needed for living room use, a combined bathroom and W.C., a fuel store and some general storage. The bedroom may either be separate or arranged as a bed-recess, although it is very doubtful if the latter is at all popular, especially during illness ; if the bedroom is separate it may be directly approached from the living room. It is preferable that both the living room and bedroom have sunny aspects, as some old people have to spend much time in bed. Fuel should be accessible without having to go out of doors. Heating is of great importance in such dwellings, as it may be required almost continuously throughout the year, and also very frequently for 24 hours per day ; solid fuel is likely to be the most economic form of heating. Cooking is probably most convenient by means of gas or electricity, as the amount is relatively small and intermittent in character. The living room fire may advantageously be used for water heating.

Old people often have difficulty in getting into and out of a normal bath, and a grip rail should be provided, but alternatively consideration should be given to the use of shower and sitz baths.

Figure 41 shows alternative typical plans of small dwellings suitable for old persons. Diagram A shows a type using the bed recess and Diagram B a separate bedroom type. The former has a combined living room-kitchen and the latter a separate kitchen.

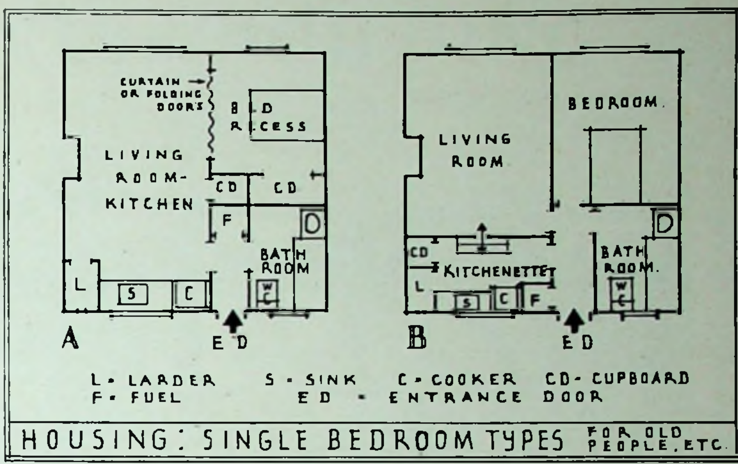
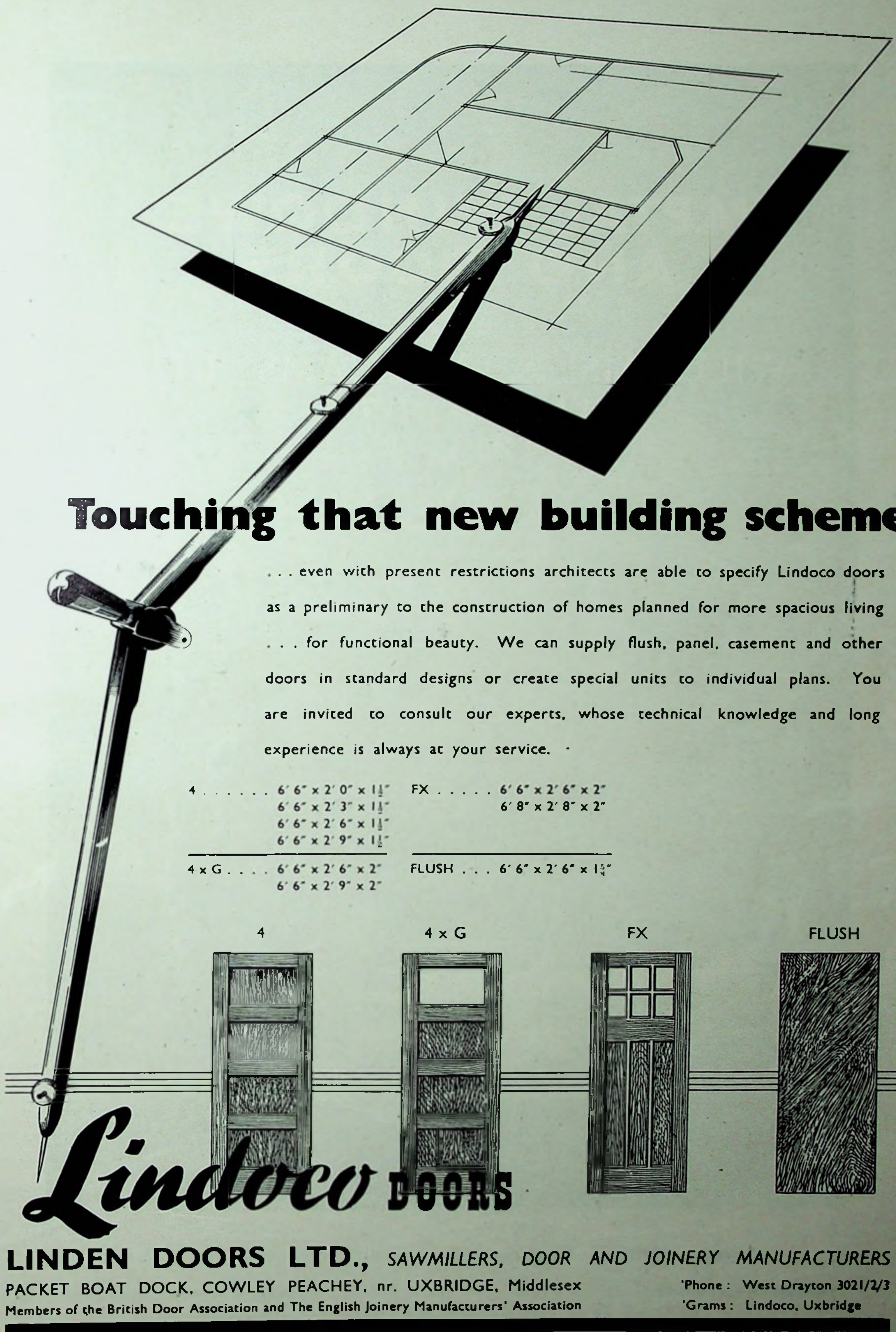


Figure 41

Single Persons—As already stated, the majority of single persons are likely to be housed either in hostels or as lodgers, but there is most certainly a call for a number of small dwellings for those whose incomes are sufficient to permit of maintaining a home of their own either alone or shared with one or more others. On many estates provision has also to be made for such persons as the district nurse, estate managers and others for whom accommodation such as that shown in Figure 41 is suitable.

Hostels are outside the scope of this section, but an increase in properly-managed accommodation of this type in and near urban centres is badly needed.

The most satisfactory method of providing separate dwellings for single persons is most probably in the form of " one-room flats." (See section : " Small Flats.") The amount of accommodation likely to be most popular does not lend itself well to the building of houses, since the main demand is likely to comprise a living room, a small kitchen, one, or at the most, two bedrooms, a bathroom and a small amount of storage space. Kitchens should be fully equipped for cooking, but on a small scale, which, in fact, means normal equipment such as a sink and cooker, but with reduced storage. Heating and hot water are most likely to be needed on an intermittent basis and if centralised services are not installed, are best met by gas or electricity excepting that a solid fuel openable stove has the advantage of keeping the dwelling warm and dry when unoccupied for daytime periods.



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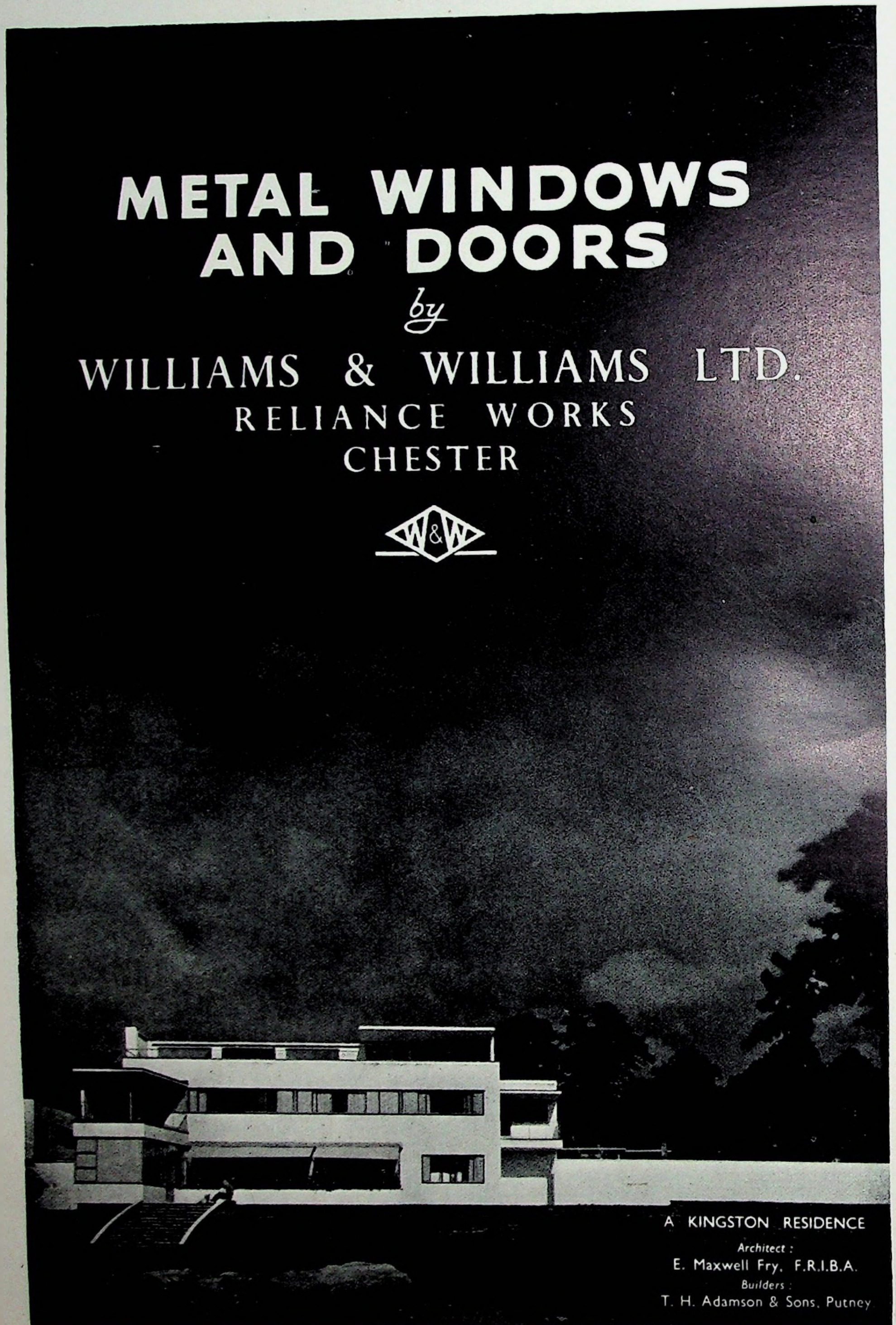
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2. *The House (for Individual Clients)*

Aspects—The primary considerations in the planning of a house are the relationships of the aspects of the various rooms and the prospects dictated to the designer by the peculiarities of the selected site. Prospect is determined by the views desired from certain rooms of the house and may sometimes be at variance with the ideal aspect for the rooms. Due consideration should be paid to each of these factors, but preference should be given to aspect, which probably means greater comfort and health for the occupiers of the house.

In Figure 1 the ideal aspects recommended for various rooms are shown superimposed upon a "sun range diagram," which gives the position of the sun at various times of each day and the times of sunrise and sunset at different times of the year, together with orientations.

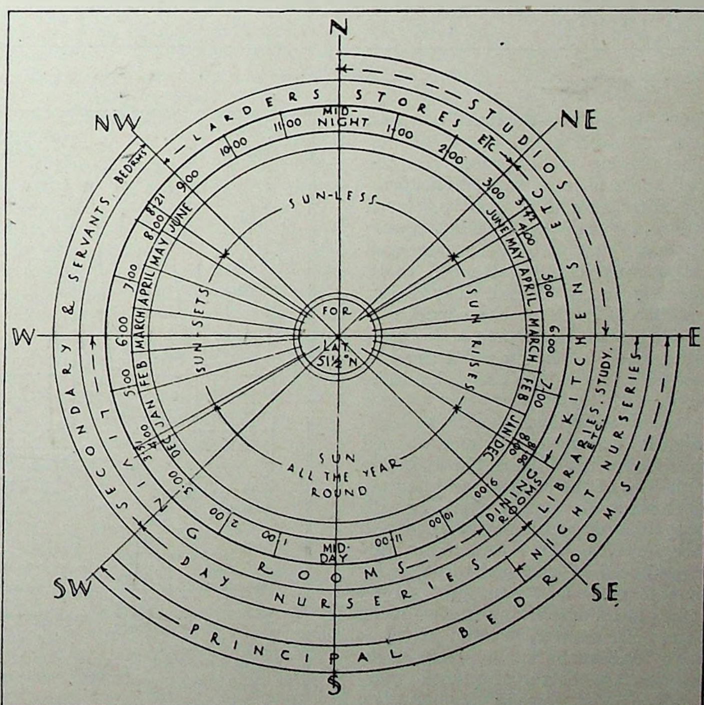
Single and Multi-storied Houses—There is much controversy as to the merits of single-storey houses as opposed to those having two or more floors. More area is covered by a bungalow than by a two-storey house giving similar accommodation; this naturally reduces the amount of plot available for the garden, an important consideration where land is expensive. Foundation and roof costs are much greater in bungalows. The space within the roof of a true bungalow is wasted except for storage. The cost of staircases is obviated and services are facilitated, but it is generally more difficult to orientate all the rooms correctly.

A compromise between the two types is obtained by placing additional rooms in the roof spaces of the ordinary bungalow type, and this is usually an economical arrangement, since the cost over the single-storey building is only the provision of a staircase, the upper floor partitions, plastering, and finishings, as the cost of foundations, walls and roof is somewhat less than the full bungalow type, and somewhat greater than the two-storey type. Many people dislike sleeping on the ground floor, except possibly at the seaside in dwellings only used for short periods.

Entrances and Approaches—Access from the street depends very much on the individual site. Independent access is preferable to the main and service entrances of the house, thus separating visitors from tradesmen's deliveries. The access to the main entrance should be obvious from the street, while the service entrance is better screened from the main approach. The main approach in larger houses should allow vehicles to reach the main door and set down their passengers under cover. Such an arrangement is, however, frequently impossible if the sites are small. The possibilities of the vehicles being able to deliver directly to the service entrance are a great asset, especially for such goods as coal, oil fuel and garden requisites.

Layout of the House—Planning is dependent on the proper relationship of rooms and of various services required by different rooms or portions of the house and, therefore, each problem should be analysed to show fundamental relationships and circulations. Figure 2 shows such an analysis for a medium-sized house.

All houses, regardless of size or accommodation, may be worked out in a similar fashion. Analysis of course, depending always on the incorporation of the particular requirements of the individual client. In the example shown there are two entrances: the main entrance to the house entering into the hall and the goods and service entrance attached to kitchen and service quarters. The hall should be regarded as a circulation space, whether it is used as an entrance vestibule only or as a lounge. It must be accessible from the kitchen quarters, so that the entrance door may easily be answered; from the hall should lead the main living-rooms and possibly the main staircase, which is the chief vertical circulation. If several living-rooms are provided, these must be grouped together as they are used in conjunction with each other. The living-rooms have to be related to the dining-room, as the owner's guests use these rooms in sequence. It may also be desirable for two or more living-rooms to be capable of being joined together by means of folding doors or collapsible partitions, to form one large room. The dining-room has also to be related to the kitchen for service of food, but the relation of the kitchen to living-rooms is less important, as there is less direct service between these two sections of the house. The kitchen and service portions, with subsidiary departments, such as larders, heating, etc., have to deal with the arrival of goods, cooking of food and service of food through the pantry to the dining-room. It must also connect with the maids' sitting-room and any minor vertical circulation (back staircase) for service in connection with the rooms on the upper



RECOMMENDED ASPECTS IN RELATION TO SUN

Figure 1

floor or floors. The two vertical circulations will, of necessity, connect by means of a corridor on the upper floor, so that access may be obtained to all the rooms both by the maids and owners without the necessity of either using the other's staircase. The corridor type of circulation, therefore, becomes more apparent, a much more definite element, on the first floor than on the ground floor.

The placing of the rooms on the upper floors is important. The principal suites should be closely related to the main staircase; each bedroom may have its own bathroom and dressing-room closely attached to it, while the latter should, if possible, have direct access to the corridor as well as through the principal bedroom itself. Guests' bedrooms and those of other members of the family should be placed, with their bathrooms, as near the main staircase as can be conveniently arranged. Nurseries need access to both staircases, the main one for the use of the children and parents and the secondary one connecting with the service department for food and other services. Day and night nurseries should be grouped together for convenience. Day nurseries should not be placed over living-rooms, owing to the noise created in them, which is apt to be disturbing. Similarly, night nurseries are better if placed away from the living-rooms in which musical instruments may be played in the evening. The maids' bedroom and their bathrooms need not necessarily communicate with the other parts of the bedroom floors, but must have direct access from the service portion of the ground floors. The upper floor services, such as housemaid's closet and linen-room, although they are used in connection with every room, should be related to the service departments of each floor to aid staff work.

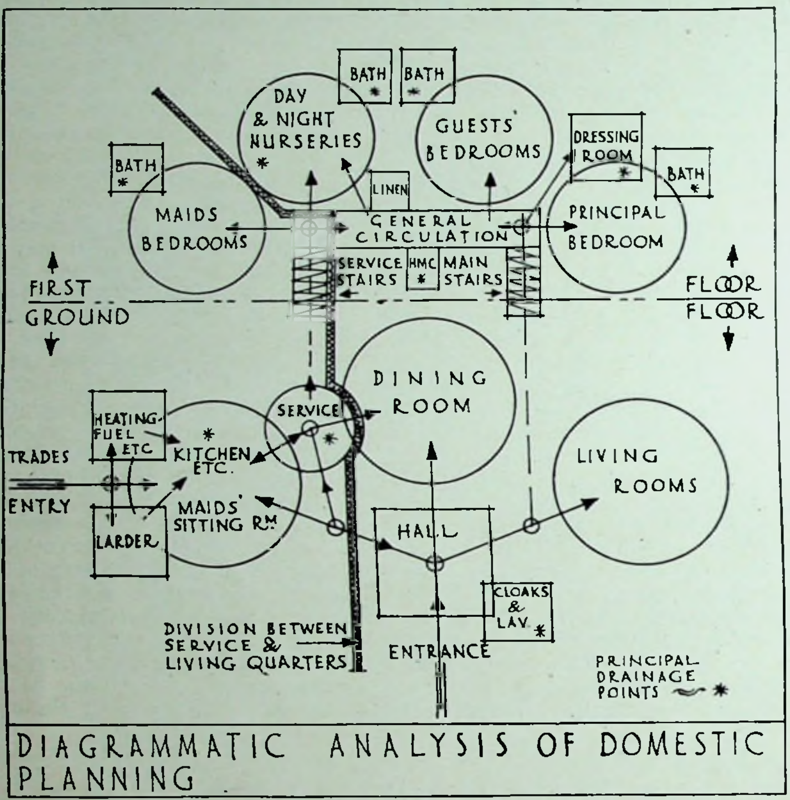


Figure 2

In smaller houses, where a secondary staircase cannot be provided, the problems should be given a similar arrangement, avoiding as far as possible the unnecessary circulation of the servants through parts of the house chiefly used by the owners.

On the diagram (Figure 2) the units requiring drainage connections are marked with an asterisk. As far as possible, all drainage should be concentrated for economy and where first-floor connections are required, these should, as far as possible, be over those on the ground floor.

Main Entrance—The main entrance door should open, if possible, into a vestibule, or at least a small draught lobby, to protect the hall, especially if it is used as a lounge-hall. The lobby also allows a maid the opportunity of speaking to callers before admitting them into the house proper. In the draught lobby or vestibule should be placed the door mat, standard sizes of which are :—

24 in by 14 in ; 27 in by 16 in ; 30 in by 18 in ; 33 in by 20 in ; 36 in by 22 in ; 39 in by 24 in ; 42 in by 26 in ; 45 in by 28 in ; 48 in by 30 in. The depth of the sinking or well should be $1\frac{1}{2}$ in and $\frac{1}{2}$ in should be added to the mat sizes for the dimensions of the actual well.

A ground-floor cloakroom is a virtual necessity in all houses except those of minimum dimensions. The lavatory basin and W.C. are very frequently placed together in one apartment, which may also provide some accommodation for hats, coats, etc. It seems generally more satisfactory if the lavatory basin, W.C. and cloaks spaces are all grouped together rather than separating the latter, especially

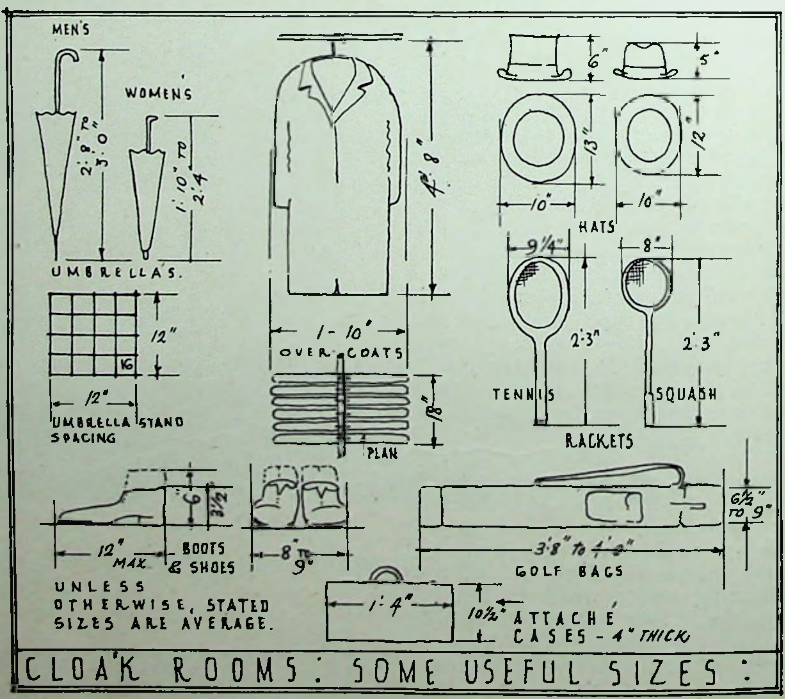


Figure 3

for the use of visitors. Clothes are, however, in some instances provided for by a fitting in the hall itself, which in a small house permits of a more economical general plan. In a larger house the lavatory basin and cloaks space are often combined, with the W.C. placed in a separate compartment, leading from the lavatory ; urinals are seldom provided except in very large houses. Occasionally three separate rooms are provided and access from the hall is directly on to the cloakroom, from which open the lavatory and W.C. compartments.

Cloakrooms—Cloaks accommodation, whether forming part of the lavatory or separate as a fitting in the hall, have to store many and varied articles besides coats and hats, many of which are suggested, with average dimensions, in Figure 3. The majority of the articles suggested need some storage space in most houses and economy of space can only be achieved by use of specially designed fitments.

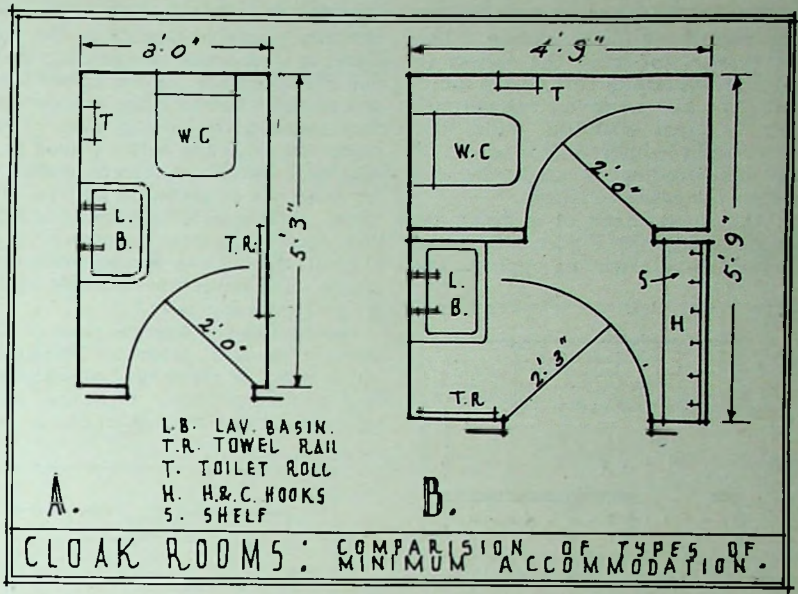


Figure 4

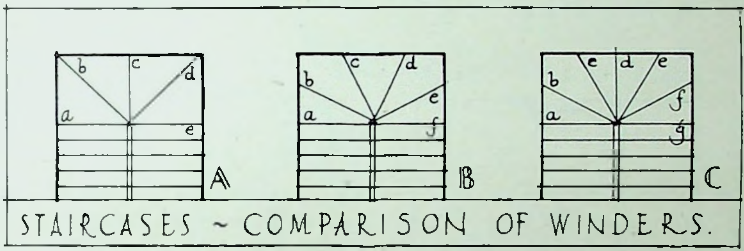


Figure 5

As a general rule, umbrellas stand in a watertight metal tray through a grid fixed about 2 ft above it ; the grid needs spaces about 3 in by 3 in. Hats require shelves 13 in wide to accommodate hats if placed end-on, or 10 in wide if placed lengthways ; hat shelves should be 7 in or 8 in apart. Coats, although sometimes hung on hooks, should be placed on proper coat-hangers, for each of which is required a space of at least 1 ft 10 in by 3 in, for men's coats, 4 ft 8 in from the centre of the hanger rod to the bottom of the coats must be allowed, but more for women's, although their coats are seldom as long as dresses.

Lavatories—The lavatory should provide, in addition to the basin (the sizes of which vary considerably), a mirror, towel rail (preferably heated) and a shelf for hair brushes, combs and clothes brushes. Care should be taken to place the mirror in such a position that those using it are well illuminated both by night and day. Shelves should be either of some hard, non-absorbent material such as tiles or marble, or covered with glass. Cloakrooms, if they are to be used by women, as is generally not the case on the ground floor, require long mirrors, at least two-thirds the full height of the average person and also space to sit near the mirror with shelves for powder, brushes, etc., within easy reach, or should be planned with space for a table.

Figure 4 illustrates, in Diagram A, the minimum dimensions which can be satisfactorily used for a combined W.C. and lavatory basin ; and in B, for the two fittings in separate compartments. Details for planning minimum lavatory and W.C. accommodation are given in the Section on " Housing."

The hanging of doors needs special attention in order to obstruct the sight of cloakroom or W.C. fittings from the outside, and, when convenient, doors to cloak spaces as in Figure 4B should open to give direct access to coathooks and hanging space. The hanging space suggested in Figure 4B consists of a shelf of the minimum width for hats (10 in) with coathooks placed below and a shelf under for boots and shoes ; if coat-hangers are required on which to hang many coats, the room would need an additional length of 10 in. Attention should be paid to the placing of towel rails, toilet-paper holders in relation to other fittings.

W.C.s Under Stairs—In large houses it is undesirable to place W.C.s or cloakrooms under the slope of a staircase, and such spaces may be used more advantageously as cupboards for golf clubs, telephones, or side tables ; but in smaller houses, to achieve the necessary economies of floor area, W.C.s are often placed under staircases. See also Section on " Housing."

The hall is usually a satisfactory situation for the telephone in a private house, permitting a servant to answer it without entering any of the living-rooms ; though this has the disadvantage that any conversation may be audible all over a small house. It may be placed on a table, or sometimes on a shelf built into the wall, with a dust-proof door or flap to close the opening. In a large house the telephone with exchange and inter-communicating switches might have to be housed in a definite telephone box or room.

Artificial lighting in the hall should illuminate the caller, so that there is no doubt as to his identity. Care should be taken to provide good heating near the entrance door.

Staircases—Staircases are discussed in detail in the Section on " Housing " and requirements are similar for larger houses, except that widths may need to be increased to a minimum width of 3 ft 3 in if placed between walls, with the handrail recessed into them and in no case projecting more than 2 in. Winder steps should be avoided unless absolutely necessary, but, if they have to be used, the type illustrated in Figure 5B will be found to be the most satisfactory. The type shown in Figure 5A gives wide but very unequal treads, and carpets are difficult to lay ; Type C is too crowded and provides uncomfortable " going," especially in descent. Winders, if unavoidable, are better placed at or near the foot of stairs than at the top, as the risk of injury from falls is thereby reduced. If projecting curtail steps are used, care should be taken not to project them into passage-ways. All staircases must have good lighting, both natural and artificial. Windows placed over the centre of stair flights are difficult to clean, especially if high up.

There is considerable controversy with regard to balustrading. The solid type is probably the easiest to clean but sometimes cuts off too much light. It is, however, sometimes easier to treat spandrils under the stairs if solid balustrading is used. If open balustrading is used, the cut string is the easier to clean.

If the lower steps of a flight are turned, as shown in Figure 6, it is wise to have the balustrading opposite the front door removable, to simplify the transport of furniture up the stairs. This is easily made possible by having removable caps to the newels and sliding the balustrade panel into grooves.

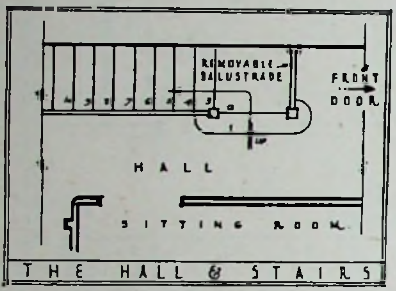


Figure 6

Sitting-rooms—Figure 7 shows four common arrangements for a sitting-room and shows the relationship of the essential structural elements. Fireplaces should be so arranged that plenty of space is available for furniture around them, as indicated by the dotted curve on the plans and windows and doors must not be placed in such positions as to cause draughts across the usual sitting places, as shown by the dotted lines marked D.

In Diagram A the door is unsatisfactorily placed in relation to the fireplace, as is also the case in Diagram B and the latter has the additional fault of a draught between the window and door crossing the sitting area. Fireplaces are generally better placed on a long wall, but where central heating is provided can be placed at the end of a room. Windows should provide left-hand light to the most important pieces of furniture, such as writing-desks and pianos. The minimum desirable width for a sitting-room is 11 ft.

Figure 8 shows average sizes of the more important pieces of furniture which must be considered when planning a sitting-room. Provision may be required for built-in radio or for cinema projectors, but, as the requirements of these vary considerably, definite figures cannot be given. Book shelves should have the following general heights between shelves : 7 in for small cheap editions, 8 in for the usual 8s. 6d. type of book, and 9 in to 14 in for the larger class of books.

Artificial lighting of sitting-rooms is generally more satisfactory with wall fittings and local lights (standard and reading lamps) rather than by ceiling fittings, except in very high or large rooms. One light (usually in a standard or a ceiling fitting) should be controlled from a switch near for principal entrance door of the room the use as a " pilot " light, or all lights may be controlled by a master switch or switches.

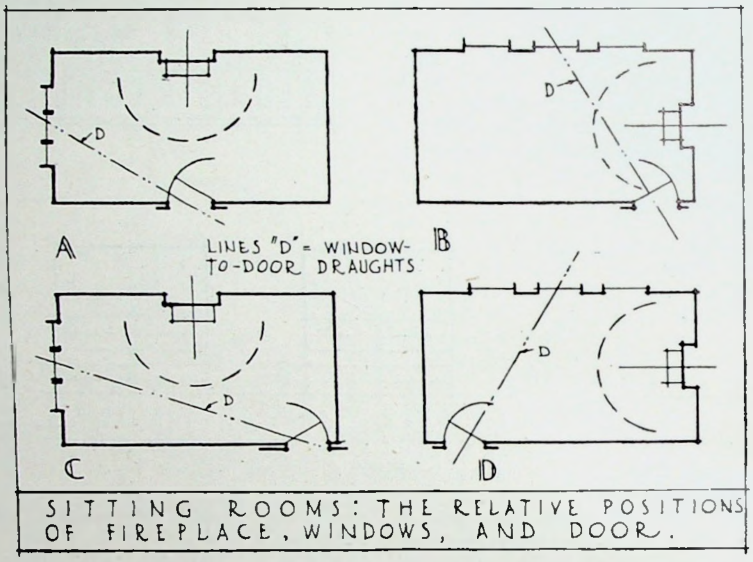


Figure 7

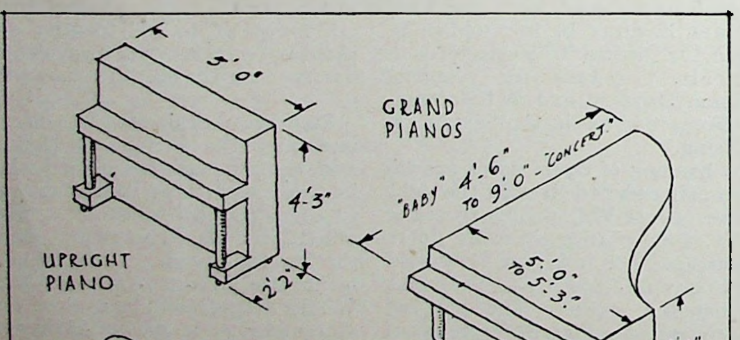


Figure 8

Dining-rooms—The minimum size of a dining-room is mainly dependent on the size of the dining table and the number of chairs to be placed around it. Six persons is usually the minimum seating accommodation provided. Dining tables are usually 3 ft to 4 ft wide, while their length is generally based on seating at 2 ft 6 in centres, with an additional 6 in to allow for the plates, etc., of those seated at the ends of the table. The depth allowance for chairs round the table should be at least 1 ft 6 in and better 2 ft, behind which should be a clear serving space of 2 ft 6 in, excluding sideboards, serving tables and fireplaces. Sideboards are usually 1 ft 9 in to 2 ft 3 in wide and from 4 ft to 7 ft long and they should be placed in proper relation to the door from the kitchen or serving-hatch. Doors should be planned to avoid opening into the space immediately round the table and, as far as possible, to avoid draught. If the room is used for meals only, heating may well be by gas or electricity, especially if central heating is also provided.

Light may be provided either by

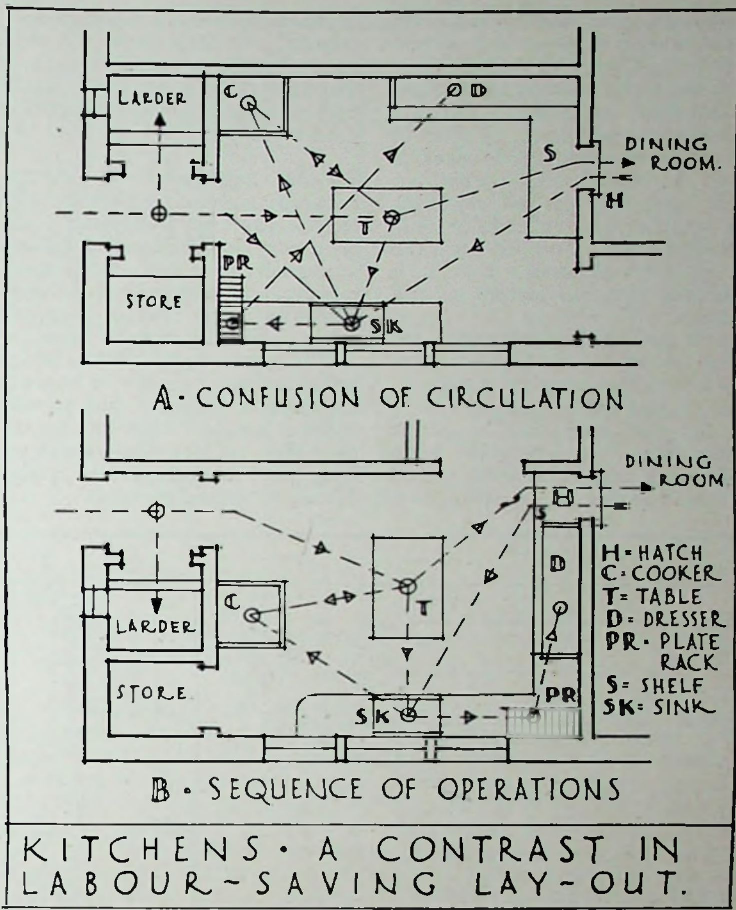


Figure 9

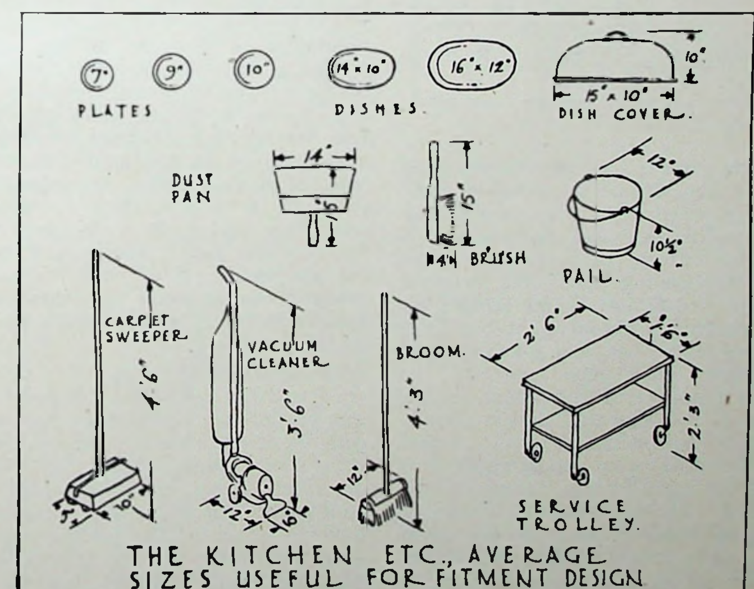


Figure 10

hanging pendants, which may be adjusted in height or by floor plugs under the table for use with table lamps. The sideboard should have local lighting, either from fittings placed upon it or from wall fittings above it and a heating plug should also be provided for a plate-warmer. The provision or not of a serving-hatch between the dining-room and the kitchen or pantry is a controversial subject owing to the difficulties of making it proof against sound and smell and of arranging it so that guests do not have a view of the kitchen. The clear size of a hatch opening should be 2 ft wide and 1 ft 9 in high. Minimum-sized dining-rooms for six persons, with a rectangular table (Diagram A) and a circular table (Diagram B) are shown in Figure 17 in the Section on "Housing." It should be noted that in the latter case the room may be made slightly smaller. These dimensions are arrived at after assuming that the room will be used only as a dining-room; if sitting-room facilities are required, considerably more space will be needed.

Billiard-rooms—These are large rooms and the floors must carry a considerable load more or less centrally, without any liability to vibration; the most suitable position is on the ground floor. A full-size billiards table measures 12 ft 8 in by 6 ft 8 in, and weighs 23 cwt, while a common, smaller size of table is 8 ft by 4 ft, with a weight of 15 cwt. Owing to the length of the cues, a clear space 6 ft wide must surround the tables; if two tables are placed side by side, at least 5 ft should be allowed between them. The foundation carrying the table is sometimes separate from the remainder of the room. Any seating or fireplace must be outside the 6 ft area. Seats should be raised on a dais. A billiard-room is of little value for any purpose other than the game for which it is designed, and may therefore be given an unimportant aspect, such as north or east. It is very difficult to provide adequate and suitable daylight for the table, and it is general to side-light the room and play entirely by artificial light. Top-light causes bad shadows to be cast by the artificial lighting fixtures, which are generally large and immovable.

Studies—These rooms should be given quiet situations, as they are essentially workrooms. The most important factor is to provide good left-hand light to the desk. The room need not be large, but should allow ample room for an armchair and bookshelves in addition to the desk, which is usually at least 4 ft 6 in by 2 ft 6 in. Artificial lighting by means of table lamps is most satisfactory.

Loggias—An open loggia to which good service may be available either directly from the kitchen or through the dining-room is very useful in warm weather. It should open towards south or west, and be protected from the east either by a movable partition or by a wall. The floor should be raised above ground level and have a good outward fall, to ensure dryness.

Kitchens—As stated in the section on "Housing" the efficiency of the kitchen depends on the layout of the fittings in relation to the sequence of their use and the essential factors set out in that section are all applicable to larger types of specially designed houses. The ideal layout for a kitchen is not always possible to achieve. Figure 9B shows a fairly good arrangement. Good light is wanted

on the range, sink and preparation table and whenever possible it should be from the front or from the left-hand. The articles to be considered in planning a kitchen and its cupboards are very numerous and varied. Figure 10 shows common approximate sizes of many of the most usual articles, but sizes of such articles as domestic ranges, whether gas, electric, or coal, refrigerators, etc., vary to such an extent in different makes that it is impossible to give satisfactory general dimensions.

Coppers are less frequently provided in larger houses today, but provision may be needed for washing machines.

Dressers and cupboards vary very much, but the main shelf-height is generally about 3 ft above the floor, with drawers and cupboards placed below it and glazed cupboards above. These fittings are generally more satisfactory and cleaner in use if carried to the full height of the room, the upper parts forming storage cupboards for articles seldom wanted, or for storage of household produce, such as jam. Drawers should not have greater height than 7 in internally, to assist cleaning and prevent untidiness and harbouring of waste. Dresser doors may either slide or be hinged. The former is more expensive and will not permit the whole to be opened at the same time. The latter creates a risk of knocking over objects standing on the main open shelf below the doors.

Ventilated hoods placed over ranges or cookers are very desirable for removing the smell of cooking. Cookers should not be placed near larders, nor should refrigerators be near cookers. Gas cookers should be placed out of draughts, so that the flames are not blown out.

The kitchen in smaller houses often has to serve the dual purpose of kitchen and maid's sitting-room, in which case the fittings should be so arranged as to leave suitable spaces for a maid to eat and sit in comfort. Separate sculleries in small houses usually cause unnecessary walking about. A separate maid's sitting-room is much more desirable than a scullery. Spaciousness is not so essential in kitchens as is good layout.

Food Storage—Food storage is generally similar to that described in the Section on "Housing" except that more than minimum requirements are usually provided. Fittings such as refrigerators and store cupboards are generally larger and need more floor space, especially in rural areas.

It is desirable that larders be at least 8 ft 6 in high if game or meat hooks are fixed in ceilings; but otherwise a greater height than 8 ft is not necessary, as high shelves are usually little used except for the accommodation of oddments.

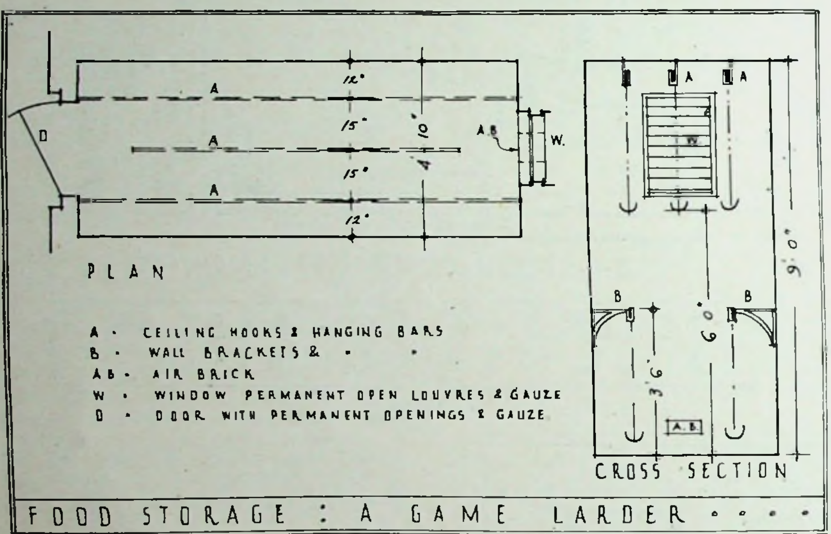


Figure 11

Game larders have to be provided in country districts, in which the produce of shooting may be suitably hung. The essential factors are a constant current of cool air, a large number of ceiling hooks and fly-proof screens. Sometimes game larders are constructed as independent buildings in charge of the game-keeper and sometimes they form part of the accommodation of the house. Cross ventilation is essential and is usually provided by means of louvred openings covered with zinc gauze and sometimes, in addition, doors similarly treated. The doors should, if possible, open outwards to increase the useful area. The height should be at least 8 ft 6 in and preferably 9 ft, so that it is possible to walk under hanging game without difficulty; the game is suspended from tinned hooks hung over 2 in by ⅜ in galvanized iron or stainless steel flats fixed a few inches below the ceiling and placed at least 15 in apart and 12 in from walls, so that the feathers of birds or skins of animals do not touch. Wall brackets at a level of 3 ft 6 in may also be used as shown in Figure 11 to carry additional hook rails.

Wine Storage—Nearly all houses and flats require facilities for the storage of wine, bottles of beer, cordials and mineral waters, in either small or large quantities. The storage of all these bottled liquids except wine presents little difficulty, as bottles may be stood in a vertical position almost anywhere, such as in fitments, or furniture in living-rooms, whereas bottles of wine need to be placed horizontally, thus necessitating the use of shelves or racks. Many smaller houses and flats where space is very limited cannot provide proper wine storage, but a cupboard fitted with patent racks is often provided, or some small space, as part of the spandril under the staircase, is similarly equipped. Such spaces cannot be maintained at even temperatures, as is desirable, and can only be considered as "makeshift" accommodation. Wine and spirit bottles vary somewhat in size and shape according to the brand, but it may generally be assumed that 14 in is normal, and that 15 in is a maximum bottle height; all but a few special spirit bottles and certain brands of colonial wine may be placed in racks allowing 4 in by 4 in spaces. There are two general types of bottle rack or bin, both of which can be made up to suit any shape or size of space provided. The first type is the "French wave" pattern, which consists of wrought-metal racks, the front rails of which are designed in waves with a pitch of 4 in. in which the bottles rest horizontally; the second type consists of a light metal framework held apart by 1 in by 1 in wooden battens placed diagonally so that the sloping sides of the battens support the bottles; the latter type is generally made with 4 in by 4 in spaces, and measures 9 in overall back to front for single-sided bins, or 18 in for double-sided bins. The first type are generally about 12 in back to front for single-sided bins and 1 ft 7 in deep for double-sided bins. Stock-sized bins are also made up of both types by many manufacturers and these can usually be fitted in when plans are in initial stages.

In larger houses special wine cellars are generally provided. Rooms for this purpose should be dark, cool and capable of maintenance at even temperatures. Similar racks to those described above are often used as equipment, but when large quantities have to be stored the space occupied with these types is much greater than with shelving, although the risk of broken bottles is increased with the latter. Shelves may either be adjustable metal shelving about 14 or 24 in deep, or tiers of slate shelving usually 2 ft wide supported on half-brick division walls, spaced 3 to 5 ft apart. The space between ranges of bins or shelves should not be less than 3 ft. The surrounding walls should be of brick and it is essential that cellars are dry. Floors are usually finished with tiles, paving bricks, or cement.

A decanting bench is sometimes required about 2 ft wide, 5 ft long and 2 ft 6 in above the floor, very strongly constructed of heavy timbers. Space may also be needed in a large cellar for bottle washing and a corking machine.

Beer may be required to be stored in barrels which are placed on "barrel tilts." The usual barrel sizes for domestic purposes are a "firkin" (9 gallons), 17 in diameter, 1 ft 4 in long; a "small cask" (6 gallons) and a "pin" (4½ gallons), about 13 in diameter and 15 in long.

Figure 12 illustrates the main data necessary in spacing out the shelves, bins, etc., in wine cellars. The spaces between racks (face to face) is shown as 2 ft, but this is the absolute minimum, as it is necessary to have adequate room in which to stoop to see bottles near the floor and also in which to place steps or other means of access to bottles in bins near the ceiling.

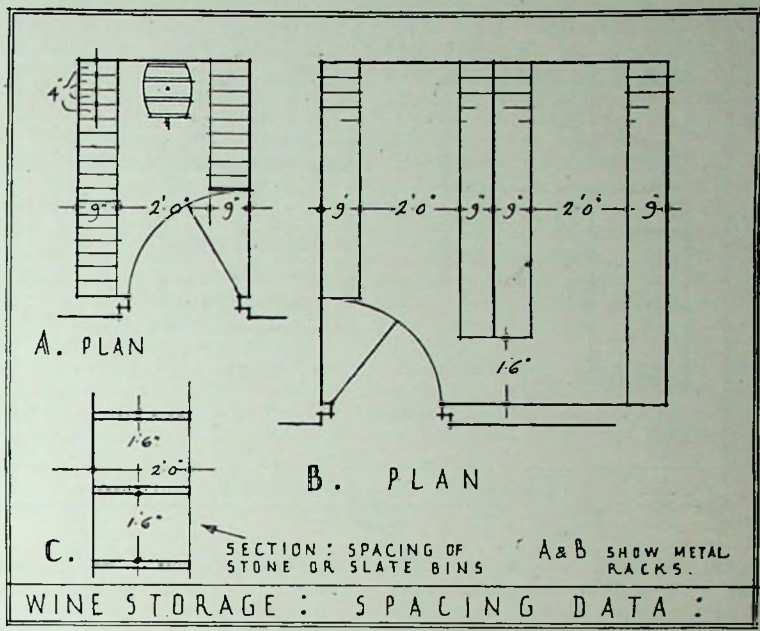


Figure 12

Fruit Storage—Many of the larger suburban houses and most country houses require some proper facilities for fruit storage. For smaller houses this is often provided in an outhouse mainly used for other purposes, such as gardening tool store, or in cellars, roof spaces, or in the lower part of a general storeroom; but in larger houses special fruit rooms are usually constructed either as part of the kitchen accommodation, attached to garden buildings or as separate outhouses.

The fruit is most satisfactorily stored on shelves of wooden slat construction or in trays similarly made. Darkness is desirable, together with ventilation which can be controlled in frosty weather. The room or building must be constantly cool and therefore placed in such a position that the south and west walls are internal ones, or alternatively made sufficiently thick; roofs should be insulated against the heat of the sun and also cold, and in many districts thatch is often adopted for this reason. Ventilators should be built in in such a manner that constant ventilation is provided, but they must be capable of proper closing to withstand frost, and also be provided with fly screens.

Shelves, when fixed, should not be more than two feet in depth and should be spaced about 12 to 15 in apart vertically. The shelves are generally constructed of wooden slats ¾ in to 1¼ in wide by ¾ in to 1 in thick.

If the shelves are made in the form of trays in racks the vertical spacing may be reduced to 6 in. in the clear, with a few shelves for very large fruit about 9 in apart. The depth of the trays may be as much as 4 ft back to front and the width up to 3 ft, but such trays become very heavy to handle. The gangways must be wide enough to allow the complete removal of the trays and for space in which to turn them when removed. This method, although more elaborate, allows of a greater amount of storage in a given space and also the trays can be taken to the orchards for filling, thus reducing the handling of the fruit.

Figure 13 shows a typical plan of a small fruit room, together with a section which illustrates the maximum height (5 ft 2 in) at which the highest shelf can be placed unless steps are used for access. The fruit must be easily visible so that it may be looked over day by day quickly and without great effort. The back slat of each shelf should leave a slight space for air circulation between the wall and shelf.

Figure 14 shows the tray type of storage and these also should not be placed at heights from which they are difficult to lift out the trays. In both types an edging piece is needed to prevent the fruit falling from the shelves or trays.

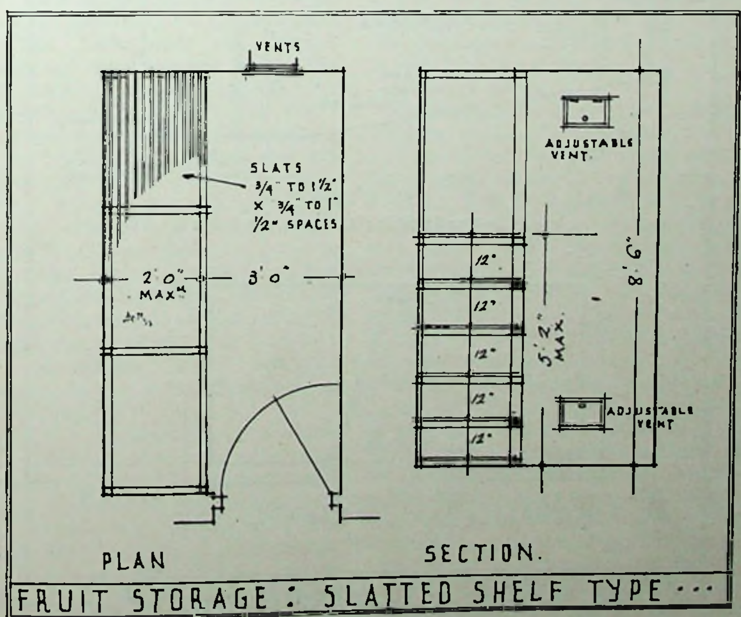


Figure 13

Fuel Storage—In the design of most domestic buildings, fuel accommodation for two types of fuel is required; first, that for ordinary fires (coal); and, secondly, that for boilers (coke), and, in some instances, a third type is also necessary when certain heating or working apparatus is using hard coal (anthracite) as opposed to soft coal. In country situations accommodation is, in addition, often required for logs. The amount of storage necessary for each type largely varies according to the proximity of the site to railway

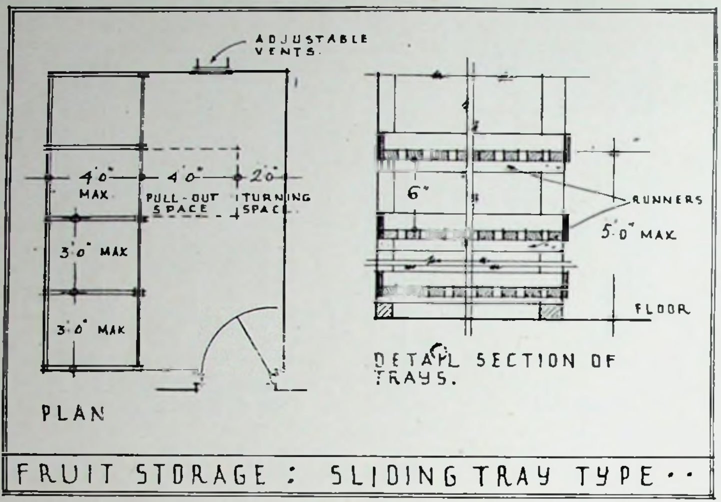


Figure 14

stations, or other sources of bulk supply ; it should be remembered that it is advantageous to buy most fuels in large quantities, such as by purchasing a full truck load and also that prices are lower in the summer, and if sufficient storage is available it is more economical to buy then for the winter months. The amount of space required per ton of coal averages about 40 to 45 cu. ft., and of coke about 80 cu. ft. It must be borne in mind that it is difficult, when standing on a level floor, to shoot coal or coke out of sacks to a greater depth than 4 ft. All fuel bunkers or stores should be equipped with "coal boards" to ensure the economical use of a given space ; coal boards are usually 7 in or 9 in wide by 1 in or 1½ in thick deal boards dropped into grooves in two vertical posts about 4 in by 3 in securely fixed to the walls or floor ; slots for lifting the coal boards are cut in the lower edges. Coal boards do not need to be more than 4 ft high in normal circumstances.

The planning of fuel stores varies considerably with the type of house, but it is very important that there should be easy access for deliveries from without and, if possible, long walks for coalmen from the nearest roadway to the fuel store should be avoided. When several sorts of fuel have to be accommodated, the stores are sometimes separated for each type and placed in different positions ; thus, coke for boilers is stored near the boiler-room and other fuel in convenient places for access to the rooms of the house. It is preferable that all access from the house to fuel stores should be under cover (if not placed within the house) and, when stores are within, the building should be so placed that dirt and dust cannot penetrate to any rooms in the house.

It is usual to provide a small area of permanent ventilation in fuel stores near the ceiling in the form of air-bricks, or by a series of holes in the door. Walls should be of fair-face brickwork and floors of smooth cement or spade-finished concrete. Fuel stores are better constructed with floors slightly sloping towards the door or "coal boards," to make the fuel fall forward and to make shovelling easier, as shown in Figure 15A ; the slope should not exceed 15 degrees.

Fuel stores in urban districts are often placed in basements or in vaults under pavements, to which deliveries must be made through coal-plates and chutes in the pavement. The maximum sizes of coal-plates placed in public pavements are controlled by by-laws in some districts ; the usual standard sizes are 12 in, 14 in and 16 in, but a maximum of 14 in diameter plates is very general. The chutes leading from the plates into the stores, when the plate is over the storage space, are usually circular and made of brick or concrete slightly larger than the actual plate, but when the chute leads from the pavement through a wall to a basement not under the plate, the plates are often square or rectangular with rectangular sloping chutes up to 18 in or 24 in wide. A slope attached to a chute of this kind should be not less than 45 degrees to the horizontal.

Figure 15 shows two arrangements of fuel stores ; Diagram B shows a layout of two sets of coal boards to divide a small fuel store for the accommodation of two types of fuel. It should be noted that in large fuel stores it is desirable to leave a space about 4 ft wide between the coal boards and the door wall in which tools, scuttles, etc., may be placed. The placing of the coal boards may be contrived in a variety of ways, giving many different arrangements to suit particular circumstances. Domestic fuel storage is further discussed in the section on "Housing."

Oil fuel for boiler firing has increased in recent years very considerably and a very important point which must be considered when planning an oil fuel storage tank is that it should be placed in such a position that a lorry may be driven within a very short distance of the fuel tank, or at least a gravity feeding pipe be installed near a roadway leading to the storage tank. Storage tanks are usually placed below ground, but in some circumstances in small installations the tank may be placed in the boiler room if a suitable brick or concrete casing is built around it. Storage

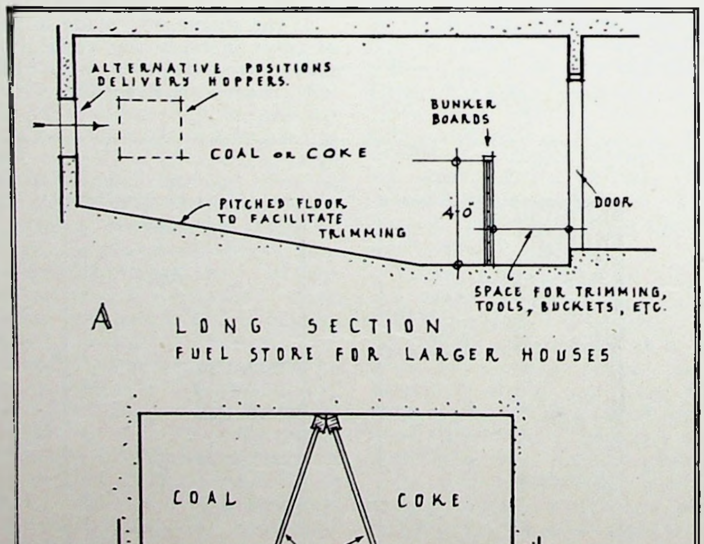


Figure 15

should be provided for a month's supply of fuel, with a minimum capacity of two tons (a small tank load), which requires about 80 cu. ft. of tank space.

Bedrooms—The bedroom, in most instances, has to serve the dual purposes of sleeping and of dressing and consequently sufficient space for both must be provided. In larger houses suites consisting of a dressing-room and a bedroom are frequently provided for the owner and more important guests, but even in that case it usually happens that the dressing-room is used by the husband while the wife still has to dress in the bedroom, or *vice versa*. The shape and size of a bedroom is governed by the space occupied by the essential furniture and equipment, which usually consists of the bed, a dressing-table, a chest of drawers, a cupboard or wardrobe, chairs and a fireplace. The relationship of the bed to the windows, doors, and fireplace is of the utmost importance, to avoid the bed being in a draught and facing the light. The fact of facing the light when in bed seems of minor importance in ordinary circumstances; the objection really arises in cases of illness, when it is very unpleasant to have to sit up in bed with the full glare from the windows directly in the eyes. Figure 16 illustrates three arrangements of a bedroom. Diagram A shows a good layout, as the draughts between the window, door and fireplace do not cross the bed, nor is it necessary to face the window when in bed. The fireplace allows sufficient space around it for sitting and on each side of it is ample space for a wardrobe cupboard of proper depth and a lavatory basin, which has plenty of elbow-room on each side of it. The position of the fireplace in this room throws the heat across the direction of the draughts and thus warms the room more satisfactorily. The position of the window permits the dressing-table to be placed so as to have left-hand side light and also avoids blocking up the window with the dressing-table, while at the same time the dressing-table is placed so as to have sitting space without interfering with the bed; if dressing-tables are placed directly in front of windows, it is difficult to open the windows or to draw the curtains and the external appearance is unsightly. There is space at the sides of the bed, as it is placed against a clear wall, for bedside tables and/or chairs. In Diagram B the bed faces the light and does not allow comfortable room for the dressing-table, nor is there room for a chair by the bed.

Diagram C illustrates a room which is really badly arranged; the bed is in a draught between the window and door and there is not enough space to place a chair or table by the bed; the dressing-table has to be given right-hand light and the cupboard is insufficiently deep for clothes storage; owing to the liability of splashing, the placing of the basin near the bed is bad. The general principles illustrated by Figure 16 apply to the design of all bedrooms. It should be noticed that the three diagrams in Figure 16 have the same area and also have the same amount of furniture; it is designed for a single bed, but in Diagram A it would be possible to use a double bed without cramping the room unduly.

Beds should not have to be placed with a long side against a wall except in very small and unimportant rooms, owing to the necessity of having to move them daily when the bed is "made" and owing to the difficulty of cleaning under them.

Doors should not be placed on the same wall as bed-heads except in very small rooms, but when this is necessary a space of at last 1 ft 6 in must be allowed for a bedside table or chair.

The ideal aspect for bedrooms is south-east, so as to be bright early in the morning, during the daylight hours in which they are used.

General Data—Beds vary considerably in width. Single beds are from 2 ft 6 in to 3 ft 6 in wide, but the most usual width is the average one of 3 ft. Double beds are 4 ft to 5 ft wide, but the most common size is 4 ft 6 in. Twin beds, if each is 3 ft wide, require at least 6 ft 6 in when placed close together. The length of a bed is usually 6 ft 6 in.

A space of at least 2 ft should be allowed on each side of the head of a double or twin beds for bedside tables. A lavatory basin requires a wall space of at least 3 ft, and considerably more is desirable; consideration must also be given to the provision of good light for a mirror placed over the basin.

A wardrobe cupboard to accommodate ladies' hats or clothes hung on hangers at right angles to the door requires at least 22 in. in the clear or, if clothes are hung parallel to the door, widths should be in units of 24 in. For a man's wardrobe the height required for hanging is 4 ft 6 in and for women about 5 ft 6 in. Cupboards for the storage of clothes are better if partially lined with cedarwood as a protection against moths.

Windows in bedrooms are generally satisfactory with the glass line 3 ft 6 in above the floor level, and they should extend to an opening height of at least 7 ft above the floor, if possible, although some by-laws permit this height to be reduced to 6 ft 6 in if rooms are in the roof.

Fireplaces and Heating—In most districts it is usual to require permanent ventilation to the outside air and, in some districts, to the roof space, if a coal fireplace is not provided in bedrooms and dressing-rooms. Heating of some nature is desirable in bedrooms, particularly in the event of illness. Gas and electricity are, however, frequently used in preference to coal, owing to the short periods for which they are in use.

Bedroom Suites—Figure 17 illustrates a typical suite consisting of a double bedroom, a bathroom, including a W.C., and a dressing-room. An important point about this scheme is that in many districts the lobby would have to be ventilated owing to the W.C. being in the bathroom; this may be done either by omitting the door between the lobby and the corridor as shown in the figure, or by ventilating over the bathroom ceiling to the outside wall by a duct, or vertically through the roof. The bedroom is well arranged in relation to the door, windows, and fireplace, while there is ample space for the necessary furniture. The dressing-room is designed to have a space for a single bed, a chest of drawers or dressing-table, plenty of wardrobe cupboard space and a

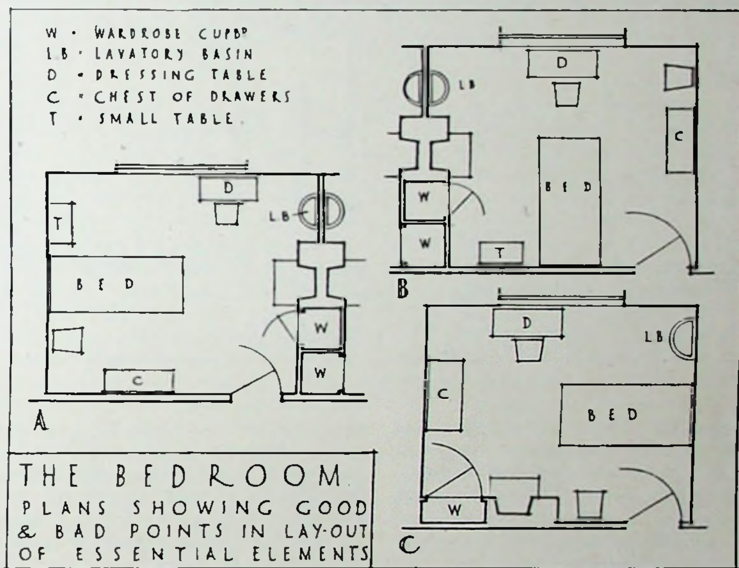


Figure 16

lavatory basin. The doors to these cupboards should be hung so as to let the light from the windows shine into the cupboard when open. Basins are generally preferred in dressing-rooms rather than in bedrooms, as many people consider the latter position unhygienic, owing to the possibility of maids using the basins as slop sinks. It is more satisfactory if baths are not placed in dressing-rooms but adjoining them, as the splashing of water and the presence of steam damages the furnishings and carpets. If a dressing-room is also used as a boudoir or study, it will need to be proportionately larger to give space for a writing table and bookshelves.

Diagram B, the minimum size when a W.C. is also installed. The length in each case is the length of the bath, and therefore the same, but the width has to be increased from 5 ft to 6 ft in the larger example. Diagram C shows a typical good layout for a large bathroom with a complete set of fittings, shower, bath, bidet, W.C., basin, towel rails, etc. The bidet and W.C. are cut off from the main part of the room by glazed screens.

Fittings—The sizes and shapes of bathroom fittings vary so enormously that dimensions are impossible to give, but for comfort baths should not be less than 5 ft 6 in long, nor less than 27 in wide over all. Basins should be as large as possible and the taps placed so as to reduce the possibility of knocking the head on them. Opinions vary as to whether mirrors should be placed directly over the basin, where steaming of glass often occurs, or on a separate wall. Good daylight on the mirror is essential, together with a proper means of artificial light. Heated towel-rails are essential.

Fittings should be chosen to avoid dirt- and dust-collecting pockets. Baths are probably best with taps and wastes fully accessible and sides and ends constructed in single slabs of suitable material, or tiled.

Sunk baths, although attractive in appearance, are difficult to fit owing to the thickness of floor required. Difficulties of getting into and out of the bath are enhanced if it is too high. The average height of a bath on feet is 2 ft, and without feet 1 ft 8 in though in the latter case the trap must be sunk into the floor. It is probable that the most satisfactory bath is one having the internal floor surface as nearly as possible level with the floor of the room. Many useful and well-designed fittings such as shelves, recessed soap-holders, etc., are on the market which assist in the complete equipment of the bathroom. Shower baths have not been used to any great extent in this country until recent years, and appear to be increasing in popularity. Their main fault in the past has been in the mixing valves, but these have been greatly improved in recent years. It is, however, generally more satisfactory to have separate taps controlling the hot and cold supplies in preference to a single mixing valve. The average size of a shower, if not installed as part of the bath, is 3 ft by 3 ft. The use of bidets is also tending to increase in this country, especially of the simple variety without sprays.

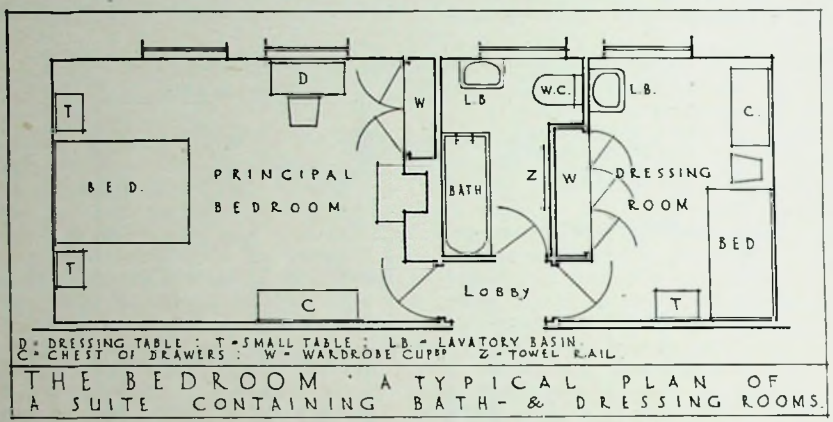


Figure 17

Bathrooms—The bathroom has become one of the most important rooms in the house, and should therefore be of adequate size, properly equipped and arranged so that good light is available in essential positions, such as at the mirror and at the end of the bath. The ideal aspect for a bathroom is south-east, to obtain as much light as possible in the early mornings.

Bathrooms have increased in number per house in recent years and will tend to become still more numerous in the future. It would seem desirable that all houses having four or more bedrooms should have at least two bathrooms. A single bathroom should be equally accessible from all the bedrooms, but if more are provided it is general to set aside one for the exclusive use of the owner by grouping it in a suite with the main bedroom.

W.C.s in Bathrooms—If only one W.C. is provided on the upper floor of a house it is more satisfactory if it is not placed in the bathroom; similarly, unless a bathroom having a W.C. in it is attached to each bedroom, a detached W.C. should be provided.

Bathrooms may be of any shape or size imaginable and frequently become very lavish in their decoration and equipment. Figure 18 shows three types of bathroom. Diagram A shows the minimum comfortable bathroom with the two essential fittings, namely, a bath and lavatory basin, and,

Bathroom Door and Windows—Doors may be slightly narrower than for other rooms, as furniture does not have to be taken into a bathroom; the minimum width, however, should be 2 ft 3 in.

Windows, if placed over the basin, should be placed high, so that the internal sill levels are not below the backs of the basins, the fronts of which are generally 2 ft 8 in above the floor level. Windows should not be so placed that they have to be reached across the bath, as there is risk of slipping on the floor, and damage may occur to the bath when the windows are cleaned.

Bathroom Finishes—Many varieties of materials are available for decoration, but they should be selected for imperviousness and resistance to damage from water and for ease in cleaning. For the floor it is preferable that the material should not be too cold to the feet, although coldness is to some extent counteracted by the use of bath mats.

Nursery—Nurseries are usually placed on upper floors, but should not be directly over reception-rooms, owing to the noise frequently produced by the children. Easy access from the kitchen is essential. The ideal aspect for a night nursery is south-east, and never westerly, as the sun is still bright in the summer months after the average bedtime of children. A day nursery may have any aspect from south to west, although it is argued that aspect does not matter, as children are mostly out-of-doors in fine weather, and only indoors when there is no sun. In larger establishments the day and night nurseries are usually formed into a suite together with the nurses' bedroom, a bathroom and pantry; but in small houses where nurses are not employed the day nursery is better placed on the ground floor, for the convenience of the mother and in that position saves the transport of meals to upper floors.

Day Nursery—This should be as large a room as possible, and should have large windows with a specially low glass line, so that the children may see out of them. The windows should be protected to the full height against the possibility of children falling out. Ample cupboard space is needed for toys, nursery china, books, etc. The question of heating

the nursery is extremely difficult to answer, owing to the great diversion of opinion ; automatically controlled central heating seems the most satisfactory, together with some form of local heating for special times, preferably in the form of gas or electricity.

Balcony—A balcony for daytime rest is a very useful asset in connection with the day nursery. It needs to be at least 6 ft wide and have suitable guard rails of an unclimbable type.

Night Nursery—It is general to plan the night nursery with direct communication to the day nursery, so that children do not have to run about the corridors of the house. Cots are usually 2 ft 6 in wide and 4 ft 6 in long. Cupboards for clothes are needed, but it should be remembered that the clothes are much smaller. It is unwise to place lavatory basins in night nurseries, especially when children are older, as they offer too great a temptation for amusement. The selection of colours used for the decoration of nurseries should receive very special attention, especially in the night nursery. Colours should not be too bright or too exciting, as they strain the children's eyes ; nor should they be in any way drab.

In planning nurseries it should be remembered that the period of this special use is limited and that the rooms may be required for ordinary bedrooms when the children grow older.

Nursery Bathroom and Pantry—The cost of providing a special children's bath is probably unnecessary, as an ordinary bath rapidly becomes necessary as the children grow. The basin, however, is better if set at a slightly lower level, to be within comfortable reach of children aged about eight to ten years. The W.C. may be placed in the bathroom and is better if it is of a special low type. The pantry needs a sink with draining boards for washing and washing-up, some method of heating for minor cooking, such as heating milk for bottles, space for a small wringing machine and cupboards. A separate linen cupboard for the use of the nursery group is desirable, and should be very well heated to ensure thorough dryness and airing of underclothes.

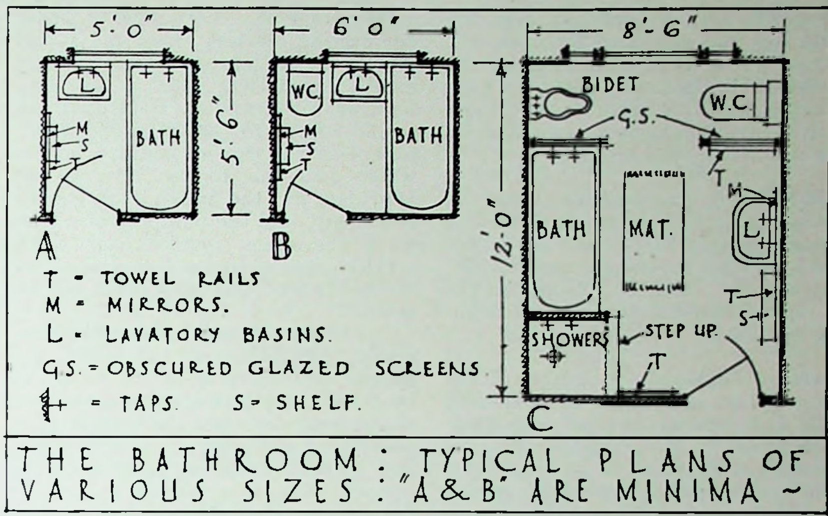


Figure 18

Figure 19 shows a nursery suite in a large house occupying a whole wing of the building. The accommodation provides day and night nurseries, nurses' bedroom, pantry, bathroom and linen cupboard grouped with a service stair leading to the kitchen.

Sleeping Porches—Open-air sleeping porches are frequently desired by clients, but, when provided, they should be carefully designed to combat the rapid changes of the English climate. It is essential that they should be roofed in some way, either by a separate roof or by placing them under the main roof of the house. Movable screens are desirable as protection against wind and rain and these may be one of several types, such as windows falling into or inside the balustrade, folding screens or windows as shown in Figure 20, or loose screens fitted between the balustrade and the top of the opening. It is generally more satisfactory if sleeping porches are placed on the ends of a building rather than on the main front or back elevation, although this position gives them east or west aspects. Thus placed, the bedrooms can have windows on the main façades without the light being interrupted. The minimum width should be at least 8 ft, and better rather more, to allow circulation round the beds. There should be sufficient solid wall against which to place the heads of the beds. Doors from the bedroom should be at least 4 ft wide and therefore of the double type. It is better if the balustrades are made solid, so as to reduce the view of the inside of the porch from the ground level.

Figure 20 shows the layout of a minimum size sleeping porch for two single beds.

Maids' Bedrooms — These are usually grouped together in a wing or on a floor above the main bedrooms and should have easy access from the kitchen wing, preferably without entering the main bedroom corridor. Each maid's room should have a minimum area of from 70 to 75 sq. ft. A separate room for each maid is the most satisfactory type of accommodation, but if two maids have to be placed in one room, it should be a long rectangle, capable of division by a curtain. Each maid should be provided with a built-in hanging cupboard, not less than 1 ft 10 in deep and 3 ft 6 in wide, the full height of

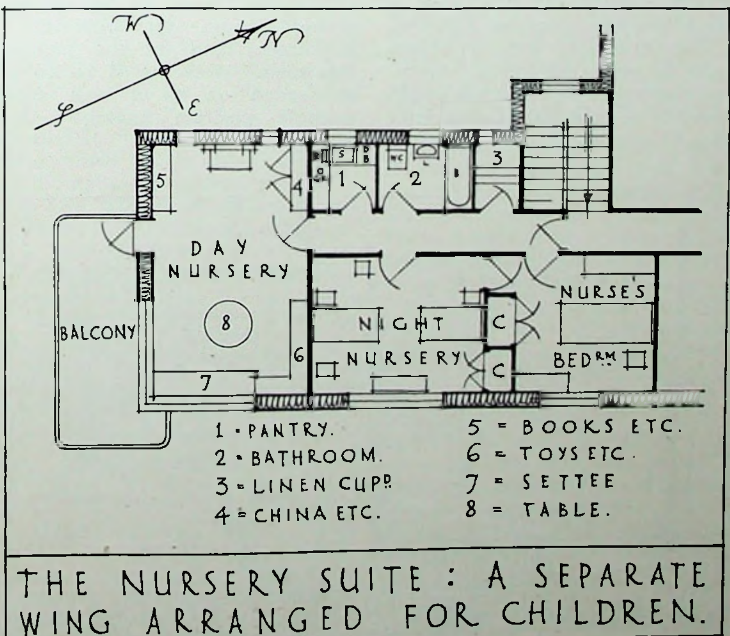


Figure 19

the room, with a cupboard over the main hanging cupboard for hats, etc. Lavatory basins in each room save a considerable amount of labour, but are unnecessary if a separate bathroom with a lavatory basin is provided for the use of the maids only.

H.M.C.—A housemaid's closet is necessary on each bedroom floor, and should have sufficient space for a slop-sink, draw-off tap with a tray for filling pails, etc., with a cupboard for the storage of brooms, dusters, and cleaning apparatus.

Linen Cupboard—A heated linen cupboard is a necessity in every house; it is best placed on the main bedroom floor. It should not open off the bathroom (as is so frequently done), as steam cannot be prevented from penetrating the cupboard and damping the contents. Large linen cupboards are often planned as small rooms with shelves on each side, but smaller ones should be placed so as to open on the long side. The shelves should have a depth of at least 2 ft, or, better, 2 ft 3 in, and should be spaced about 12 to 15 in, apart vertically. Excessive depth of shelves is useless, as articles placed on them must be visible from the front, and shelves placed too far apart vertically mean that too many articles are placed upon each other, again causing difficult access. The width of the shelves is governed mainly by the size of the large sheets and blankets folded as returned from the laundry, the former at 1 ft 10 in long and 7 in wide, and the latter about 2 ft by 2 ft. Ventilation is desirable in the linen cupboard, and preferably daylight, although this latter is often difficult to arrange. Good artificial light is essential, and should be arranged to shine directly into the cupboard. The heating of the linen cupboard should be made part of the domestic hot-water supply system, and not the heating system, so that heat is provided throughout the year even when the heating system is closed down during the summer months. Heating may be arranged by placing the hot-water cistern in the cupboard or by using a radiator or pipe coil; the latter system is more satisfactory, as just sufficient heat may be provided by a radiator having the correct area of radiation surface, whereas if the cistern is used, excessive heat is provided and therefore valuable heat is lost which might be retained for the hot-water service by lagging the cistern. The shelves are usually formed of unpainted wooden slats about 2 in by 1 in spaced ½ in apart, to allow circulation of air and heat. Details of smaller linen cupboards are given in the Section on " Housing."

Domestic Services—The services required in a house are tending to become more numerous and complicated year by year, but the extent of their use in each job is largely a matter of cost. Very few of these engineering services affect the actual plan of a building to any large extent except in matters such as size and number of boilers, fuels to be used and stored, flues to be provided, etc., except in the case of country houses where machine rooms have to be provided for the making of gas or electricity, and the pumping of water, etc. The areas required for these services depend so much on the size of the house that no useful guide can be given.

In districts where all services normally available are provided by supply companies, it should be borne in mind that trenches, ducts and chases may be used for several purposes except that in no case must gas and electricity be together.

Heating, Hot Water, etc.—Since houses vary so much in size, comparative systems cannot usefully be discussed here. The points to be watched, however, are: the number and type of boilers required, such as separate boilers for hot water and heating or an indirect system from one boiler; where they are to be placed, as, for example, in the hall, kitchen, or separately; whether the stoking is to be done by indoor or outdoor staff and what fuel is to be used. Fuel storage, however, must be close to the boiler room. In the case of oil, the tank should be placed in relation to outside delivery and then pumped or fed by gravity to the burner. There are many aids to reduction in fuel costs and to comfort which should be remembered, such as automatic dampers and time control switches which raise the boiler temperature at fixed times and maintain it as required. Radiators should be placed close to the greatest cooling surfaces affecting each room, usually the windows.

In many country districts none of the usual services, such as lighting, water and drainage, are available and must be provided by the owner. Various systems of lighting are available, but the most usual is electricity provided by means of a petrol or oil engine. An ordinary small plant providing up to 5 kilowatts requires an engine room about 15 ft by 10 ft and a battery room about 10 ft by 6 ft but a plant such as this does not leave a large margin for power loads. Water may be lifted from the well to the storage tank by an electric pump, automatically controlled by high and low level switches, or by means of a pump operated directly from the lighting engine.

Drainage—For isolated houses this may be either by means of cesspools, or, better, by septic tanks as the latter do not require much attention, and the effluent is more easily disposed of by irrigation.

Other Services—To be considered in planning are refrigeration, telephones both external and internal, radio and cinema projectors. Refrigerators are usually purchased as complete units, using either gas, electricity, or paraffin, as ordinary domestic requirements are too small to justify the installation of a refrigerating plant. House or internal telephones are being substituted for bell systems in many houses to avoid the necessity of a maid answering a bell to find out callers' needs. Radio now needs consideration, both with regard to wiring from the set to each room and the necessity for providing plug connections to operate the set. Cinema projection, although at present in its infancy in private houses, is undoubtedly growing in popularity with the employment of the miniature film. Special projection boxes are not needed, as the films are non-inflammable, but some sort of box or fitting in which the necessary plant may be placed without using pieces of furniture, which may be liable to the possibility of damage by heat, is an advantage. Such a fitting should provide room for operating the instrument and for the storage of film reels. A throw of 15 to 18 ft is needed on to a wall from a suitable position having electricity supply.

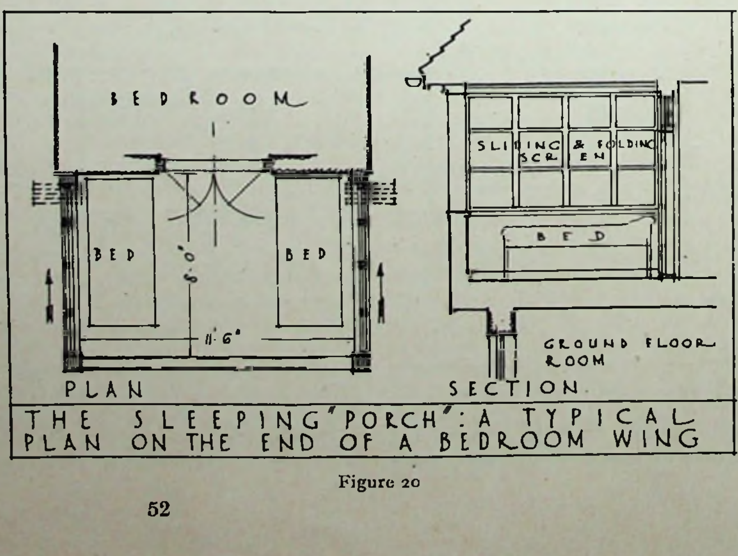


Figure 20

THE GARAGE

Information on the requirements of garages associated with houses is given in the section on "Housing" the details given are equally applicable to larger domestic types, though it will be found that larger garages are often needed, with space for two or more cars, with increased workshop and washing space areas, especially where a chauffeur is employed.

Relation of Garage to Approaches—If the site is narrow and there is insufficient space for an "in" and "out" drive, the best solution is a single drive leading directly to the garage, with the entrance to the house placed as near to the drive as possible. One gate only is then needed and the single cross-over of the public footway is a considerable economy, in addition to the shortness of the length of the drive. It will be seen from Figure 21 that the minimum frontage width in which a complete double entrance drive can be arranged is 70 ft, owing to the space needed for turning and the necessity for having a length of straight greater than the length of a car in front of the door, so that a car may draw up to the steps properly. The garage should be placed so that the car may go to it with the minimum amount of turning and reversing after setting down passengers.

Drives and Turning Circles—The minimum drive width should be 8 ft to allow a car to pass a person in the drive and a greater width is very desirable. Gateways should never be less than 7 ft 9 in wide in the clear.

The minimum turning radius for the average car is 20 ft to the outside of the roadway, but 25 ft is a more satisfactory allowance and reduces the risk of damage to grass and curbs and to the wings of the car by contact with boundary walls.

The construction of drives should be sufficiently strong to permit moderately heavy traffic up to about 2-ton loads to pass over it without damage to the surface or foundations. Special heavy manhole covers and gullies are required for the same reason. Slight camber and falls to drainage gullies are needed; the former should be at least $\frac{1}{4}$ in, preferably $\frac{1}{2}$ in, for each foot of width between the centre and the edge of the roadway. The roadways should be constructed in the following manner: Excavate vegetable soil to necessary depth, fill with 6 in of "bottoming," 4 in of coarse ballast, and finish with 2 in of finer ballast as a "topping." The "bottoming" may be broken brick or stone, clinker, or burnt ballast, and is most satisfactory if mixed with chalk, which acts as a binder. The "topping" should be good binding gravel and "hoggin." These light roadways are often finished by being coated with patent binding liquids or with tar and sand. Ordinary tar-bound macadam paving is sometimes

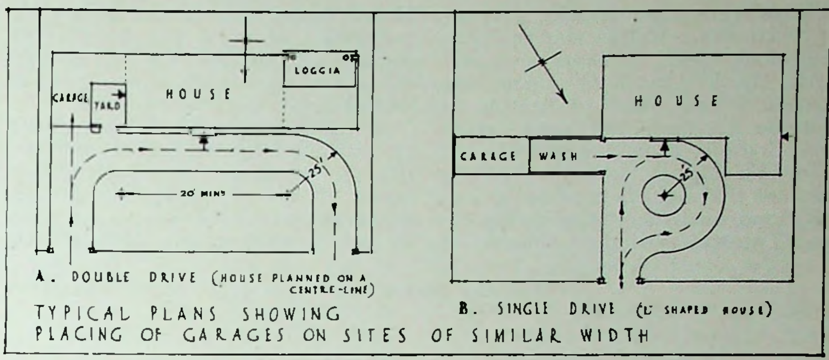


Figure 21

used over the bottoming, in which case 2 in of coarse mixture finished with 1 in of fine is sufficient; but the appearance of tar paving does not favour its use for private roadways. Alternatively, a light concrete road may be used. Brick or stone paving may be used, but are too costly if the length is great, although the laying of two lines of stone flags in gravel drives spaced at about 4 ft 6 in centres, to take the average track of motor vehicles, saves considerable expense for re-topping and work with rollers. Some form of edging or curb is desirable to prevent damage, the most general materials being brick, special garden edging tiles, or concrete.

Drives on Sloping Sites—If gradients are necessary, they should be reduced as much as possible and 1 in 12 should be regarded as a maximum. A slope towards the doors of a garage needs special care to prevent water running past any outside gully and entering under the doors. The only satisfactory solution of this difficulty is to provide a drained iron channel covered with a grating the full width of the doorway. A sufficiently wide flat space must also be provided to allow the doors to open if they are large and side-hung, opening outwards. An additional difficulty, if the gradient is steep, is the mechanical one of driving the car up an incline when the engine is cold.

Sizes of Garages—Motor-cars vary in length from 9 ft to 18 ft 6 in over all and for general purposes allowance should be made for a length of 16 ft. Widths vary from 4 ft to 6 ft 6 in, and at least 8 ft should be provided so as to allow for car doors being opened and easy circulation round the car. The width for garages to hold two cars may be slightly reduced from two single widths, but should not be less than 14 ft. Since a certain amount of running repair work must be done on all cars, ample circulation space is an essential rather than excessive space near the engine. The largest types of private car seldom exceed 7 ft in height, and doors with a clear opening of 7 ft 6 in are sufficiently large.

Washing Spaces—These are better placed out of view from the approaches to the house, although this is frequently impossible on a small site unless doors are provided at each end of the garage and the car is driven out to a space at the back for washing purposes. The washing space should be made of concrete, with a smooth surface laid to fall to a gully which is best placed centrally, so that the person washing does not have to stand in running water. The regulations for gullies vary in different districts. Some allow drainage to storm-water drains with an ordinary gully, especially if provision is made for one car only. Some require petrol gullies, and others require the drain to be into the soil system, either with or without special gullies. A good size for a washing space is 10 ft wide and 20 ft long, so as to ensure that water cannot splash dirt and mud on to the car from the surrounding wall or other surfaces.

Benches—A work bench with shelves above and a cupboard beneath is a valuable addition to the garage, but care should be taken that it does not impede circulation round the car.

General Construction and Equipment—Garages may be permanent or temporary structures, but, in the latter case, insurance rates are liable to be increased. Walls do not need plastering internally. Floors should be of a hard material such as concrete, which will not be damaged by oil or petrol waste. Ceilings, which may be of plaster or asbestos and composition board, should be provided to assist in keeping the building warm in winter and fire-resisting construction is needed if rooms are built over the garage. Floors should be level, so that the car brakes may be released without risk of the car moving. A slight incline or run-up of about three-quarters of an inch in the width of the door frame helps to stop rainwater driving under the doors.

Permanent ventilation is a necessity, and gratings should be provided near floor and ceiling. Windows should be placed so that the light is thrown on to the engine, and doors need not be kept open during repairs. An economical arrangement is to glaze a side entrance door. Doors may be of various types. The two-door type opening outwards and folding doors require more space than those sliding

sideways on overhead tracks or opening vertically. Roller shutters are occasionally used. If doors open outwards, hooks to hold them are essential. Some form of heating is desirable to keep the temperature above freezing in cold weather.

The placing of artificial lighting points so that light is provided at the bench and over the engine is important. Two-way switches should be placed at each door if two points are provided. At least one plug point should be provided for a portable lamp, and an electric power point is desirable for charging batteries.

A cold-water supply is needed for car-washing purposes, and to avoid the risk of freezing, this connection is better if placed inside the garage, while the valve should be equipped for a hose connection. The addition of a lavatory basin is a great asset, especially if a non-resident chauffeur is employed.

The provision of curbs is unnecessary, but some form of stop is desirable to prevent driving too far into the garage. The most satisfactory stop is a baulk of timber fixed to the floor. An inspection pit is unnecessary unless several cars are kept and all repairs done at home.

(*See also sections on " Housing " and " The Motor Vehicle "*)

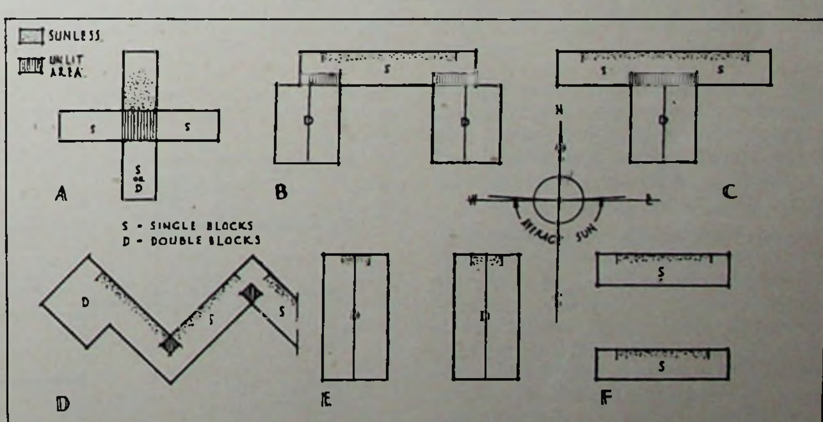
3. *Flats*

Introduction—The flat is primarily a type for town development, for crowded areas and expensive sites. The tendency for it to increase in popularity is due to various causes, the most important of which is the desire to live in towns and, therefore, close to centres of work and business, with corresponding avoidance of loss of time in travelling from suburban houses. Another and important cause is the reduction of domestic responsibilities and labour which flats provide, especially when it is remembered that rents are often inclusive of rates, taxes, upkeep of staircases and gardens, heating and hot water. Accommodation is generally smaller than that provided in houses for a similar class of tenant, but equipment and finishing are generally of a higher standard and better quality as a compensation. A criticism frequently levelled against flats is a possible lack of privacy, but it is very doubtful if this is much less than in ordinary town houses, planned in terraces or than in rows of suburban dwellings, for each flat can be self-contained and approached from a staircase and lift hall, which are, in fact, a vertical extension of the street. Two of the essentials of good flat design and construction are efficient insulation between the flats against the passage of noise and an adequate lift installation, if the flats are above a certain height.

Sites—The selection of a site for a block of flats in the heart of the city is more dependent on its shape and size for a satisfactory development than on situation. Practically any site is possible if the ground value is not prohibitive as it would be in districts suitable for offices (for example, in the City of London), but excessively noisy sites should be avoided if possible. The relation of ground value to rentals and to the type of accommodation to be provided, are two of the main deciding factors in site selection. Rentals are not directly relative to accommodation, but to the situation of the site, which may be illustrated by the fact that a two-roomed flat in St. James's, London, may be equal in rental value to a seven- or eight-roomed flat in Hampstead. The suitability of the perimeter, shape and size of the site may be more practical for one type rather than another ; as, for instance, a particular site might be more economically developed with three small, high-rental flats than, say, two larger flats, since the latter might be slightly crowded and thus not command the full rental for their type. Surrounding property also needs careful consideration, especially in regard to rights of light ; and the fact of having other flats near is an advantage rather than a competitive disadvantage, unless the district is already over-built. Actual site conditions, such as those which govern excavation, drainage and foundations, should be weighed up with particular care, as excessive costs below ground are a great tax on total construction costs. The locality of the site in districts outside the heart of a city needs thought from other points of view, and more particularly in regard to access, transportation to business centres, to shops and to amusement centres ; in outlying districts quietness from traffic noise is essential, but nearness to road and rail facilities is a great factor and it may well be said that the nearer the building is to a station the more likely it is to let quickly. Flats in country districts do not let easily, as the rentals are of necessity often greatly in excess of separate houses providing similar accommodation. In partially undeveloped areas the trend of the neighbouring developments must be considered very carefully and only sites in improving districts should be entertained for flat schemes, as such schemes can only be looked upon as investment projects. Attention should be paid to any possibility of using the ground floors for shopping purposes, a factor which also has the advantage of providing a development for a part of the basement (as shop stores) which is generally of little value except as lock-up (and often unused) flat storage. If the trades for which the shops are used are controlled no disadvantage is incurred by placing shops below flats. The relative merits of leasehold and freehold property is beyond the scope of these articles, although they influence site selection very greatly.

Types of Flats—There are very many types of flats, ranging from one room and bed-sitting-room types at low rentals to luxurious apartments with seven or eight bedrooms and three reception-rooms. The variations are enormous, both in accommodation and in rental, but it must be remembered that a medium rental flat often has similar accommodation as regards number of rooms, but is completely different in equipment and finish and *vice versa*. The varying differences are dealt with in the consideration of the room requirements, but generally it is unwise to mix too many types or have great variation in rental values within the same scheme.

Aspects.—The aspect of a site for flats is not of very great importance, although the position of the roads for main and secondary access will always have a certain amount of influence. As regards the actual blocks themselves, aspect is an important factor when deciding on the plan shapes to be used. Figure 1 illustrates six typical plans of block shapes commonly used for flat developments. Type A is bad, as the northern wing has no direct sunlight and, in addition, a large part of the floor area is impossible to light from windows in the external walls. Type B is an economical shape, as only a small portion is without sunshine at some time during the day ; the two wings projecting southwards may be of double flat width and the open space between may be fairly narrow, yet still allow sufficient penetration of the sun to all windows.



FLATS : THE SHAPES OF BLOCKS IN RELATION TO ASPECTS.

Figure 1

Type C has similar merits but, in addition, often works out in practice to be more economical as to the number of staircases required for development. Type D is uneconomical in land on the majority of sites and has a great deal of external walling. Type E generally proves to be one of the most economical plan shapes in regard to the amount of land required, but has the limitation that kitchens and larders have to be given sunny aspects unless internal areas are used. Type F has some advantages of Type E, but it requires much more ground area as the blocks must be placed farther apart to allow the sun to reach the lower windows of the back block. This may be seen from Figure 2, which shows the spacing necessary for blocks of various heights when they are running east and west. The amount of sunless wall in Type E is very small and neither in this nor in Type F are there any spaces difficult to light.

Built-up Frontages—It is sometimes necessary to build up to the building line of a site, especially in towns where site values are high and in suburban districts where the street frontage is valuable for shop developments. One of the great disadvantages of a street frontage development is traffic noise, which is very difficult to overcome, but trouble is considerably reduced if the site has an open space or low buildings on the opposite side of the street. Bedrooms should not be placed overlooking busy streets even if the result is bad aspect.

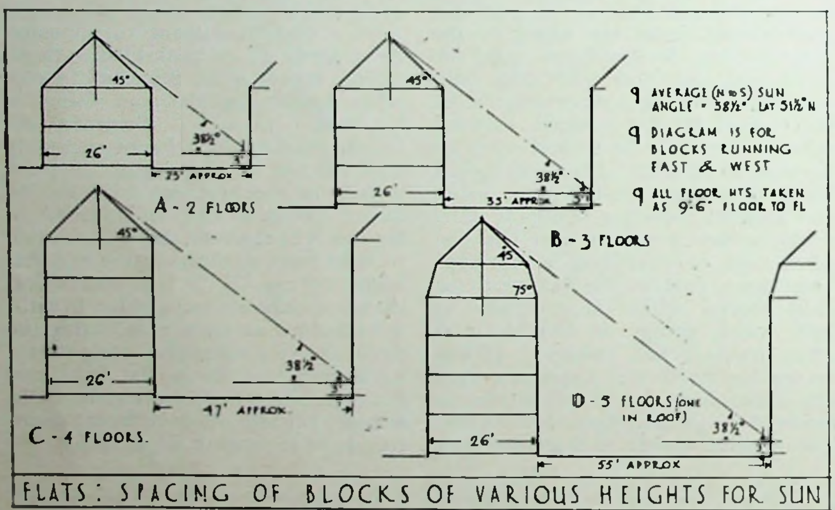


Figure 2

Access to Flats Over Shops—Access to flats placed over shops usually presents a difficult problem, as owners do not like wasting, on the flat entrances, frontage which would otherwise be available for shops producing high rentals. Generally speaking, however, the main entrance should be from the main street, as, if it is from a secondary street, the rentals are reduced as the address must be that of the secondary street, and the main entrance may also be difficult to find. In the case of flats let for low rentals or to be used for the purpose of housing the tenants of the shops, it is of less importance to enter from the main street and therefore if a side street (or any space in the rear of the buildings) is available, it may be used for the entrance, as shown on Figure 3, Diagram A. If any entrance is required between the shops a passage of at least 5 ft wide is needed, and the staircase, which needs at least 7 ft 6 in, can then be placed well back from the frontage, avoiding the use of more valuable rental space, as illustrated in Figure 3, Diagram B. When flats are of the medium or high rental class considerably more space must be allowed for the entrance as it is essential to have it sufficiently large to permit of good planning and decoration without any feeling of meanness, since first impressions gained by prospective tenants and visitors are of the utmost value. Secondary access for service uses may with advantage be placed in a secondary street and should not be visible from the main entrance; by the use of secondary streets tradesmen's vehicles are not likely to block up the approach to the main entrance.

Lettable Ground Floor Space—Shops or business premises may be placed under all classes of flats so long as the street justifies shops of a quality approximately equal to that of the flats. The shops are usually suitable for only one or at the most two frontages of any block and frequently very difficult planning is involved to provide suitable areas and access to shops on two frontages, and to flats on back parts of the site. In most central urban districts it is an advantage to have basement space under the shops, most of which is used for storage purposes, as in such districts storage and backyard space is not available. In suburban districts, however, basements are seldom provided, as they are built to occupy sites of shallow depth which only permit the placing of one block along the frontage thus leaving yard space at the rear; flats or maisonettes over shops of this kind do not generally produce high rentals, so that they are occupied by the shopkeepers or their managers and thus produce a three-story building having the living-rooms on first floor and the bedrooms on the top floor; direct access to the flats from the shops is not usual as fire protection regulations make the construction costly, while the amount of space required for placing a staircase in each shop greatly exceeds the space required for a common stair to the first floor which is used to form a balcony approach, as illustrated in Figure 4.

It is impossible to give more than a rough guide as to sizes for shops, especially as to the necessary frontage widths to be allowed. Shops very frequently have small frontages of 12 to 15 ft in expensive streets where the trades are mostly of a luxury nature, whereas in the better streets of suburban areas larger widths up to 25 ft are often needed. In the secondary shopping streets frontages are again of the smaller sizes, averaging 15 ft. Shops should generally be of greater depth, usually between 35 and 50 ft, than the flats above, which generally do not have a span exceeding 28 to 30 ft, as shown in Figure 4; this difference in depth permits the top lighting of the back part of the shops by lights (often pavement lights) and also allows ample space for the common approach to the flats. As noted above, shop widths may vary

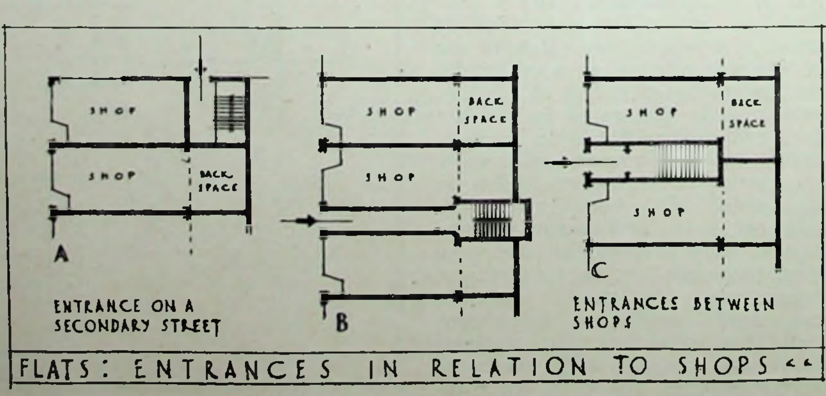


Figure 3

much according to the type of district in which they are situated, but a good general width may be taken as 16 to 18 ft. If shops are made of greater width there is a tendency to subdivide them into two, which is not favoured by landlords, nor is it wise from the æsthetic point of view. It will be found that the spacing of the shops has very considerable bearing on the design of the flats over them, as if they are narrow it is difficult to place a flat or maisonette over each shop even on the two floors and, equally, if they are moderately wide the flats are uneconomically large. If a corner site is developed, the shop having the return frontage has greater value owing to the increased display space, but unless both roads are of real shopping value it is useless to continue the shop-front along the secondary street for more than the depth of the shops fronting the main street.

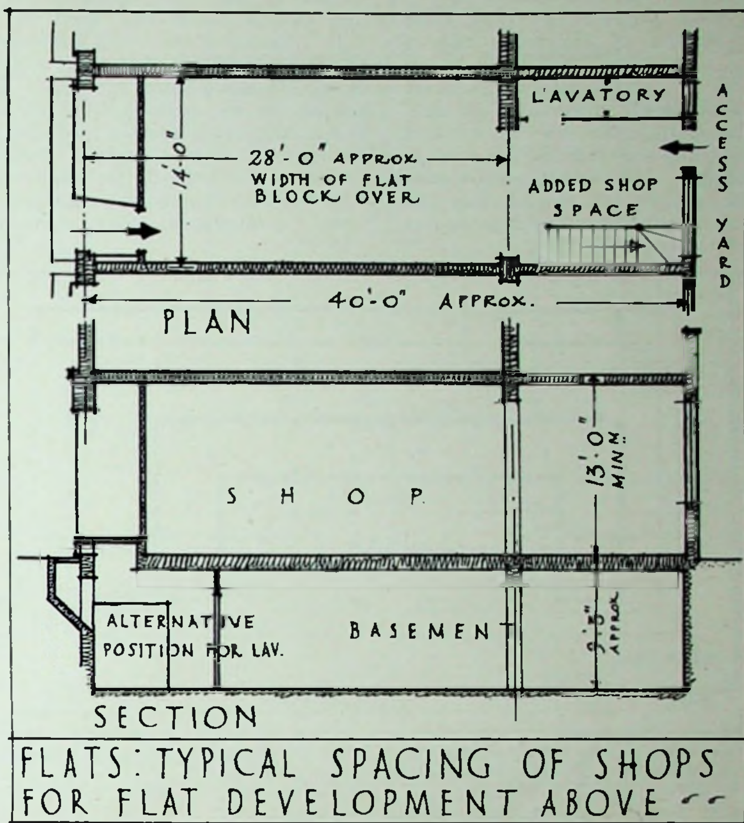


Figure 4

Flats on Various Floors—Ground floor flats are generally unpopular and therefore do not produce such high rentals as other floors. Except where there is an area which is difficult to cross, the risk of burglary, and also the fear of passers-by looking into the windows, frighten many tenants. Basement flats are now subject to strict regulations, may be prohibited under some town planning schemes, and should not be included in any new flat projects. Top floor flats are usually the most popular so long as there is really efficient lift service or the blocks are not of excessive height for easy stairway access, which is three or at the most four floors to any living-rooms, with an additional floor over for bedrooms, turning the top two floors into maisonettes. Abroad, the higher the floor above the ground, the higher the rent and there seems to be a similar tendency in this country. Top floors are lighter, less noisy, obtain more sunlight and cleaner and fresher air.

For flats for working-class occupation or of a very low rental type, the five-floor plan is probably the most economical, but in the medium class economic rentals cannot be obtained for flats without lifts if more than three stories high and it is generally found that the choice of scheme is between the three-story building without lifts and one carried to the maximum permitted height with lifts, so as to spread the cost of the latter together with the necessary attendants over the maximum number of flats. The building heights are governed by the restrictions laid down in the by-laws as to maximum heights and also by economics of construction and fire-escape requirements ; the latter affect very much the planning of flats, as alternative means of escape are necessary in buildings of more than three stories, certain exceptions being made when balcony approaches are employed with independent staircases, all of fire-resisting materials.

Portions of Sites Not Built Over—In the development of large sites it will usually be found that only about fifty per cent. of the total site area is covered by the actual building, leaving the remainder as areas, courtyards and gardens. These spaces unbuilt upon will have to be differently treated according to the type or class of flat. In the case of tenement or working-class dwellings the whole of the site should be closed to traffic and used as play areas for the tenants and their children. Where moderate rentals are charged, a certain amount of layout and gardening is necessary, but again traffic approaches are not particularly required. The more expensive and luxury types, however, need traffic approaches to the main entrances as well as to service entrances ; cars should be able to set down passengers under cover at the main entrance doors, but driveways into buildings for this purpose on crowded town sites are usually expensive and wasteful, without sufficient justification to warrant adoption.

Main Approaches—Main entrances to all better-class types should be easily visible when approaching a block of flats ; when sites are not too small or are of such shape as to permit it, entrances to all flats in a block should be through the same doorway (or past the same porter's lodge on large schemes), so as to avoid the cost of duplicating attendants.

Secondary Approaches—The lower rental types do not, as a rule, have secondary approaches or secondary access to the flats, but for all other classes secondary service entrances are essential for tradesmen's deliveries, which must have proper road approaches. It should not be possible to confuse these approaches with main approaches ; the two must therefore be separated as much as possible ; side or back roads where available should be used as shown on the left-hand side of Figure 5, or, if they are not available adjoining the site they should be formed on the site itself, as shown on the right-hand side of the same figure. On town sites where basements occur over the whole area, secondary access is often provided through the basement, to avoid wasting ground-floor space ; a single entrance is usually provided, so that easy control is possible and this gives access to circulation corridors passing the various service stairs and lifts.

The basement approaches are even elaborated into carriage-ways, as shown in Figure 6, so that deliveries may be taken directly to each service lift by tradesmen's vans and also carts may collect refuse from the bottom of each refuse shaft ; an additional point achieved when this scheme is used for sites bounded by busy streets is that tradesmen's vans need not be parked for long periods outside the building. The service-ways and the service stair-

cases also serve as the alternative means of escape in case of fire.

Forecourts—If sites can be developed to permit the use of forecourts such as those shown in Figure 5, many advantages are gained. A more attractive approach is generally possible by careful lay-out and gardening, traffic to the flats is more easily handled, car parking is often made possible and street noise is to some extent reduced. Forecourts should be laid out in a formal manner without undue elaboration and with a view to economical upkeep. Concrete roadways are most satisfactory, as their appearance may be reasonably pleasant as opposed to tar macadam and the upkeep is less than if gravel is used. Grass is not very expensive in upkeep, but flowers, although possibly necessary in small quantities and helpful in general effect, are a considerable charge on the owners, who usually bear the upkeep costs.

Forecourts and gardens add greatly to rental values and aid in letting. The general appearance of the building is usually enhanced and the outlook from windows is very much more pleasant.

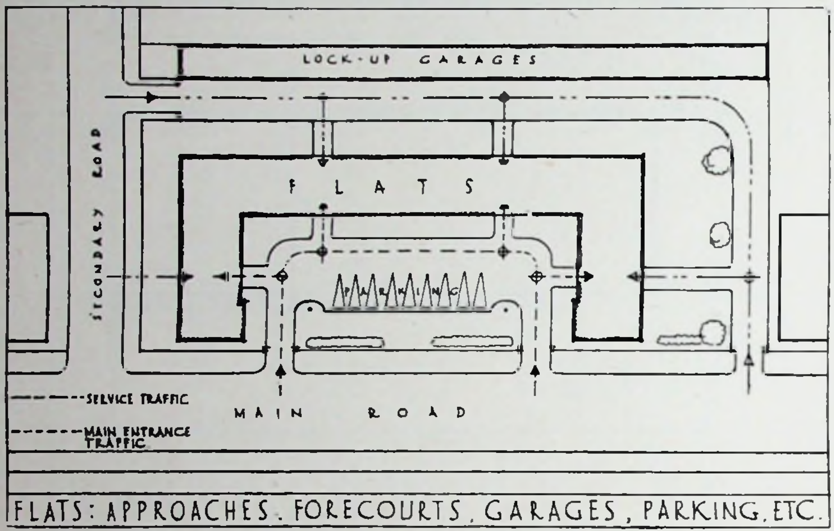


Figure 5

Car-parking—It is highly desirable to provide some facilities for parking the cars of callers at the flats. Large areas cannot, as a rule, be provided in schemes in central areas, but elsewhere, and especially in the suburbs, every opportunity should be taken to fulfil the need. Figure 5 shows a good arrangement for parking a number of cars in a forecourt which can be worked with one-way traffic. The average car requires a parking space of 7 ft 6 in by 16 ft. (see section on "The Motor Vehicle.")

Courtyards—Planning round closed courtyards as suggested in Figure 7 is not so satisfactory as forecourts and courts which are open on one side. Rooms overlooking these courtyards (and in point of fact any enclosed area) do not command such high rentals, as the outlook from windows is not attractive and the air is inclined to become rather stagnant. Sunlight is difficult to provide for windows on lower floors without exceptionally large courtyards. The courtyard rooms are often believed to be quiet, but this is not the case if traffic is permitted into the courtyard as suggested in Figure 7, more especially if traffic passes through the court to the garages at the rear of the site. Again, unless the courtyard in Figure 7 is very large, the whole area is needed for turning space and thus attractive layout is difficult and car-parking impossible. If the main entrances to the flats are in the courtyard and cars are to drive up to them, the minimum width of the area is about 60 ft.

However, for lower rental blocks where traffic need not enter the courtyard, this type is very good, so long as the courtyards are not smaller than is needed to allow the sun to penetrate to the lower-floor windows, which again means a court, running east and west, of about 50 ft width for a five-story block. This area can then be laid out as a very pleasant and restful garden.

Garages—The motor-car is said to be a fundamental reason for the development of the flat, especially in suburban areas. Many people keep a car in preference to maintaining a garden and, also, flats are easily shut up and left, allowing tenants to go away for week-ends more easily. Very low rental types do not often require

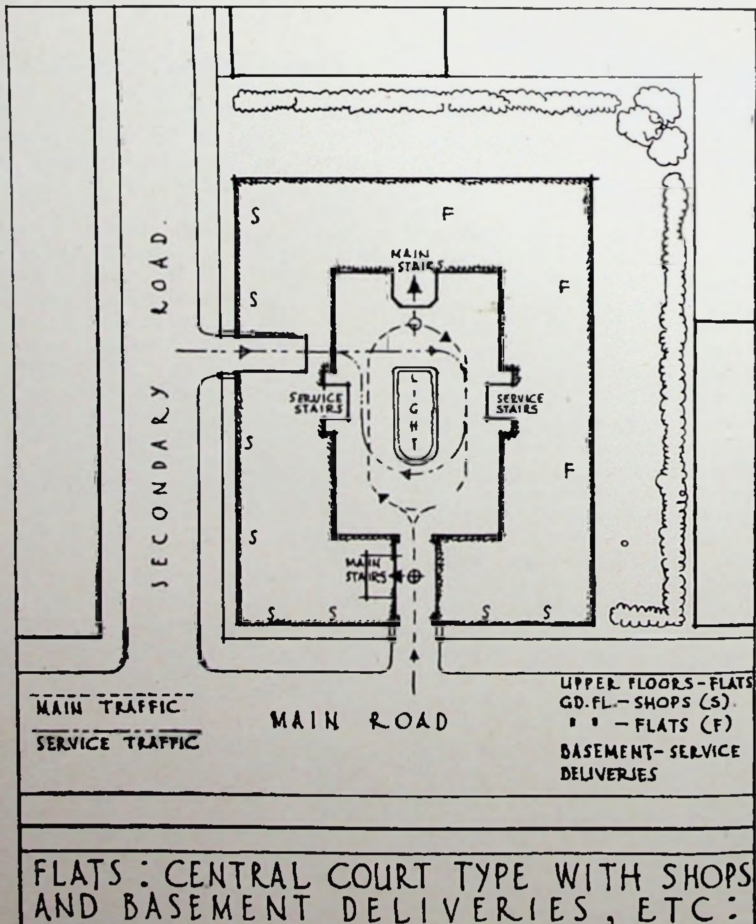


Figure 6

garages, but the proportion rapidly increases with greater rentals. Many schemes of flats having an average rental of £120 p.a. inclusive have one garage for every two flats. These garages are more satisfactory if provided in the form of separate lock-ups rather than of the open type. Garages may be placed with great convenience at the backs of sites such as shown in Figures 5 and 7, but are better if served by a separate roadway and, as already mentioned, through the main courtyard, both alternatives being shown on Figure 7. Garages, if placed at the back of the site as in these figures, require, in addition to a 20-ft roadway (which also serves as a work space), some separation from the buildings by grass or similar means; if the garages are too close to the ground-floor flats these are reduced in value owing to noise, smell and outlook ; in any case it is better if main rooms do not overlook the garages.

The major portion of the basement of a large block of flats is usable as garage space, though the space is difficult to lay out easily by reason of the supports needed for the flats above ; in addition, the car ramps occupy considerable space, unless it is possible to place them outside the general mass of the block. This method requires extra consideration as to the fire-resisting qualities of the building and, in addition, generally (by reason of the space required) eliminates all use of the basement for purpose of storage, servants' rooms, caretaker's quarters, etc.

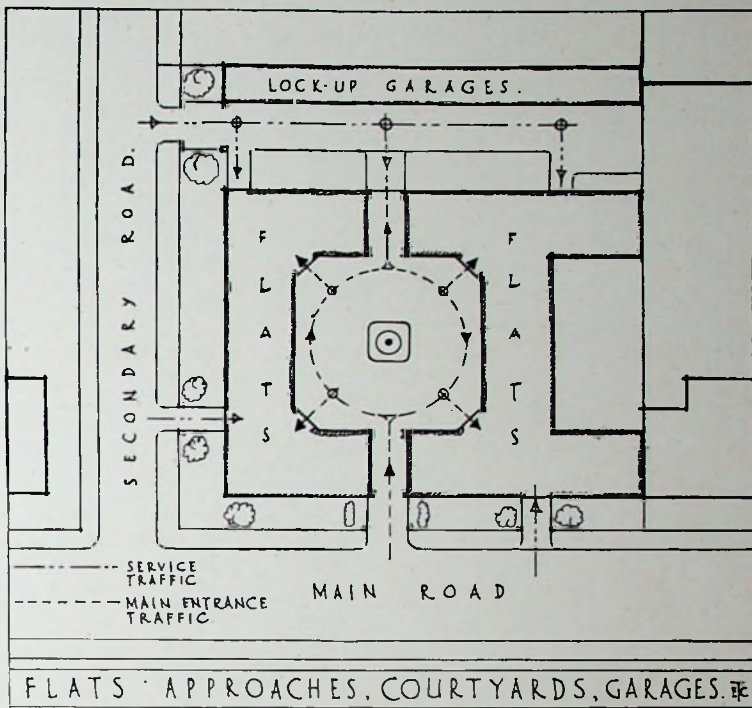


Figure 7

Rental producing Spaces Other Than Shops—There are many possible auxiliary sources of revenue (other than shops), in flat schemes, and these depend very much on the situation of the site. Bank and insurance company premises usually produce high rentals and are valuable and more suitable tenants than would be many types of shops. Corner sites are especially valuable for this type of letting. Such premises may be introduced into schemes which are of a purely domestic nature without detriment to the flats. In some streets the ground floor may be lettable as consulting rooms for doctors and dentists who will generally pay a higher rental than can be obtained for a flat in a similar position ; separate approaches are desirable for such accommodation leading directly from the street into private entrance halls and waiting-rooms, though in many positions the former may be one of the general entrances for the whole block of flats. The accommodation usually consists of a number of suites of one or two rooms grouped round communal waiting- and service-rooms. Good light is important for all the rooms. The equipment necessary can, as a rule, be introduced into an ordinary room without very special planning, except for special electrical apparatus, which sometimes needs additional space and consideration.

Restaurants are rather a speculative proposition in the majority of flat schemes except when the flats are to be let as service flats or to be let to special tenants such as business women. Very few schemes are sufficiently large to provide sufficient internal custom and therefore they can be used only when the site is so situated as to attract passing as well as " internal " trade. Restaurants are usually more satisfactory if leased to a separate operator rather than run by the flat management. They can only be placed, as a general rule, on ground floors, with, perhaps, a mezzanine or gallery ; this arrangement permits the kitchen to occupy basement space which is otherwise seldom very productive. Great care must be taken to avoid kitchen smells from the restaurant or its kitchen penetrating to the flats on the upper floors.

Offices are not as a rule lettable if placed in flat blocks except possibly to estate agents and then only if they are themselves managing agents for the flats.

Some extra rental also may be obtainable from basement or other store-rooms for the use of tenants, but the rents charged are generally very small and they barely cover the capital outlay of building and equipment costs, but even this means the avoidance of dead loss on what would otherwise be useless or wasted space. In high rental schemes, extra bedrooms for servants (usually men servants), are frequently provided and leased separately to tenants. These rooms are often grouped with the resident head porter's flat, either in the basement or in a space impossible to develop as ordinary flats. It is usual to have one resident porter or caretaker in all schemes of any size, regardless of type, as it is desirable to have a responsible person always in the building, even allowing for the loss of rent frequently involved by the provision of porters' rooms. In some very high-class schemes additional bedrooms for tenants' guests are provided, but these are a very doubtful asset.

Accommodation for Various Types—The number and type of rooms provided does not necessarily vary according to the class of flat required, as previously stated. The high rental class includes small types having only one bedroom and one sitting-room, increasing up to seven or eight bedrooms and four sitting-rooms, while the tenement and lower middle class accommodation is virtually the same in room numbers except as to the number of bathrooms and service rooms such as pantries. Situation, amenities, facilities, equipment and general finish are the governing factors in rental values.

The table (page 60) shows the usual distribution of rooms in any flat having a given number of rooms, from the smallest sizes up to the luxury class, but it must be borne in mind that there are many possible variations and also that there are much larger flats than those suggested such as have been built in central London areas in the inter-war years. The commonest types for various classes of tenant are : for tenement, assisted and low rental classes, Types E, H, and I ; for single business women such as secretaries, etc., Types A, B and C ; for lower middle class tenants Types I, J and K, and for middle class tenants, Types L, M and N.

FLATS: TABLE SHOWING ACCOMMODATION FOR VARYING TYPES:									
TYPE	Nº OF ROOMS	LIVING ROOMS	DINING ROOMS	KITCHENS	BEDROOMS	BATHS	SCULLERIES	W.Cs	NOTES
A	1	ONE	—	recess in Living Rm	recess in Living Rm	ONE or common to several	—	ONE or common to several	may be corridor type.
B	2	ONE	—	ditto.	ONE	ONE	—	ONE may be in Bath Rm	may be corridor type.
C	3	ONE	—	ONE with Bath	ONE	—	—	ONE	
D	3	ONE	—	ONE, or combined with scullery	ONE	ONE	—	ONE may be in Bath Rm	
E	4	ONE	—	ONE	TWO	ONE	—	ONE	
F	4	ONE	—	—	THREE	ONE	ONE used as Kitchenette	ONE may be in Bath Rm	Bath sometimes in Scullery.
G	5	ONE	ONE	ONE	TWO	ONE	—	ONE ditto.	
H	5	ONE with Range	—	—	THREE	ONE	ONE	ONE ditto.	working class.
I	5	ONE	—	ONE	THREE	ONE	—	ONE ditto.	ditto.
J	5	ONE	—	ONE	TWO & ONE for maid-small	ONE	—	ONE.	
K	5	ONE	ONE	ONE	TWO	ONE	—	ONE may be in Bath Rm	
L	6	ONE	ONE	ONE	TWO & ONE for maid-small	ONE or TWO	—	ONE or two	
M	7	ONE	ONE	ONE	THREE & ONE for maid-small	ONE to THREE	ONE	TWO	
N	7	ONE With or without Lounge Hall.	ONE	ONE	FOUR	ONE to THREE	ONE & Pantry.	ONE to three.	may have Cloaks off Hall.
O	8	ONE ditto.	ONE	ONE	FIVE (2 maids)	TWO or THREE	ditto.	TWO or THREE	ditto; sometimes with separate men servants Rms
P	9	ONE or TWO ditto.	ONE	ONE	FIVE or SIX	THREE	ditto.	THREE	ditto. ditto.
Q	— VARIATIONS OF 'P' (9 ROOMS) OR LARGE TYPES WITH MORE THAN 8 or 9 ROOMS.								

Types A and B are most economically arranged on the corridor principle, as, if they are approached from ordinary staircase halls, the small number of flats served from each staircase or each floor is generally uneconomical, especially if the building is high enough to require lifts. Baths are sometimes placed in sculleries so as to reduce plumbing and economise space in the very small types which may be let at low rentals and in tenement schemes, but on the whole, it is an unsatisfactory arrangement, especially if the occupants comprise more than two adult tenants with only young children and it is wholly impossible in any type where a maid might be required. Similarly, W.C.s may be placed in bathrooms (except where the bath is in the kitchen), if the same limitation of the number of tenants is made. In any case a separate W.C. is generally preferred by all tenants and is important as a letting factor.

In large-type flats the kitchen, maids' bedrooms and maids' bathroom are generally formed into a suite of rooms and cut off as much as possible from the rest of the flat ; it is owing to the formation of such suites that menservants' accommodation is generally separated from the flats.

Sculleries, as apart from combined kitchen-sculleries, are only needed for expensive types and even then are not always provided. A serving pantry is generally considered to be much more useful if there is only sufficient space for either a pantry or scullery.

Entrances—As already stated, the position of main entrances to blocks of flats of all types should be obvious to visitors approaching the building and, except in low rental types, they should always be from the main street frontage if possible. Opinions vary as to the advisability of direct entrances to ground floor flats but it would seem, certainly in better types, wiser that all persons should pass through the main hall under the control of the porter, although some tenants might prefer the privacy of their own separate entrance. In smaller types it is often more economical to enter directly to ground floor flats or even to form maisonettes of the ground and first floors ; in any case the solution is often dependent on whether areas have to be provided for the lighting of basements or lower ground floors and the height of the ground floor level above the street ; this should not be too great, as much of the site area may be lost by the provision of an unnecessary number of approach steps ; the cost of providing bridges across areas is another factor to be taken into consideration.

The main entrance is of great importance in all types, excepting tenements, since prospective tenants and visitors are receptive to first impressions at this point. It should lead as directly as possible to the staircases and lifts, but should not be more cramped than is absolutely necessary ; adequate space is needed for use by tenants and visitors waiting for lifts, cars or taxis and in better types ample room for a porter's desk should be provided. The position of this feature should be carefully considered from the point of view of ease of vision required for supervision of the entrance, lifts, etc. Good decoration and furnishing of a quality in keeping with the rental value is essential. Large lounges in connection with the entrances are unnecessary and wasteful except in service flats as tenants usually wish to go as directly as possible to their flats and do not require accommodation for common use. A draught lobby at the entrance is essential to prevent the entrance hall and staircase lobbies being uncomfortable, and to reduce heating costs. Lifts and staircases should be placed

in positions easily seen by visitors on entering and should not be hidden away in small lobbies adjoining the entrance hall. It is seldom found necessary or desirable to have name boards in entrances, but frequently, especially in better types, postal letter boxes are provided and connected with the various floors, if the building is high, by chutes. Access to the basement (if any), is not generally provided for the use of tenants (who reach it, if they need, by the service staircases), but secondary access at the main staircase for the porters to their mess- and locker-rooms or to service-rooms often saves much time and energy.

Placing of Staircases—The efficiency of most schemes, especially of lower rental types, is dependent on the number of flats per floor served by each lift, main and secondary staircase and on the reduction to a minimum of corridor and public spaces. The greater the number served from each staircase hall, the less the proportionate cost per flat inclusive of public space.

Figure 8 illustrates some of the common methods of arranging flats around the staircases. The service staircases, which also form the secondary means of escape necessary for buildings having more than two stories above the ground floor, have a great influence on the lay-out and must be considered in conjunction with the main staircase arrangements. Type A is the simplest and commonest arrangement, having two flats only on each floor, with the secondary staircases placed between two such units; this type is largely used for low and medium rental schemes on fairly open sites. Type B has three flats to each main staircase, but has a fault in the fact that it is difficult and uneconomical to provide a secondary staircase to the projecting flat. Type C has four flats round the main staircase with two secondary ones placed between two flats. Type D, which is frequently used for crowded sites, has the advantages of four flats to each main and secondary staircase, except on end units; the secondary staircases are placed in the light wells between two units and are approached by bridge connections. Type E is often used on congested sites for high rental flats; it has four flats round the main staircase with two service staircases in the areas backing on to and lighting the main staircase. Type F shows six flats placed round a main staircase, but it requires three secondary staircases; this scheme involves a very large amount of external wall and may be uneconomical from that point of view, even though a large number of flats are served from a single staircase. Type G illustrates the corridor method of arrangement useful for very small flats or service flats; staircases are placed at each end and the length is only limited by the usual requirement that no entrance (in this sense exit) door should be more than 80 ft from a staircase. One of the objections to the corridor lay-out is that all service takes place in the corridor, which is the main approachway.

Staircases—It is usual in this country to make an important feature of the main staircase leading to the individual flats and not consider it for its purely functional purpose as a means of escape in the event of fire or a breakdown in the lift service as is the American conception of a staircase; there is, however, a growing tendency to subordinate the stairs and give the lifts the most important position in relation to access. The minimum width of a staircase should be 3 ft 6 in. in any class of flat scheme, as furniture is difficult to move in less widths; greater widths are preferable in all but the low rental types.

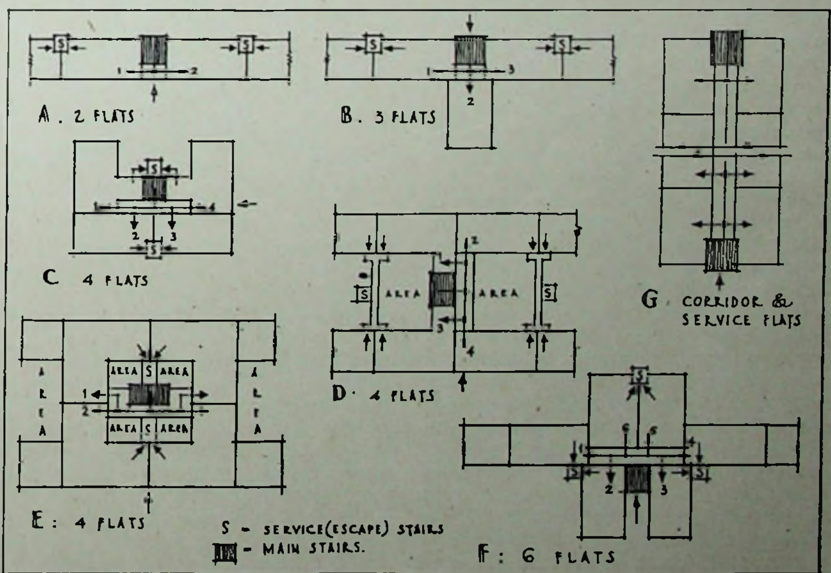
The going of staircases should be made as easy as is convenient in the space available; treads 9 in wide with risers of 7½ in are the maximum steepness for the cheaper types, and 6½ in risers for the better classes. Winders should not be used. Staircases must have daylight and natural ventilation and therefore have to be on external walls which, in larger schemes, are generally internal area walls. Good artificial light is also essential for all staircases and corridors.

Lifts—The provision of lifts is a debatable point in many schemes; they are essential in all better types, and in medium-priced schemes having more than three floors. Low rental schemes do not need lifts if they are not more than three stories high or four stories if bedrooms only are placed in the roof approached by individual staircases in each topmost flat or maisonette. Small lifts, when provided, are preferable; five persons as the maximum capacity is a good rule to adopt. Generally the lifts should be operated at high speeds. As a usual course, only one lift is provided for each group of flats except in luxury types where the risk of breakdown or undue waiting on the part of tenants or visitors cannot be permitted; one lift will serve flats providing accommodation up to 150 persons satisfactorily (150 persons can only occur with corridor plan types).

Lifts should, if possible, not back on to walls which are part of a flat owing to running noises. Everything possible should be done to reduce sound transmission from halls to flats or from one flat to another.

Public Corridors for circulation on each floor should be as wide and as short as possible in all types; 3 ft 6 in is the absolute minimum and 5 ft more suitable. Main ground-floor corridors between entrances and lifts are better treated as wide galleries for better-class types, 10 ft width at least being desirable in luxury types to permit good architectural treatment. Although initial and upkeep costs are very high, corridors, entrances and staircases should be covered with carpet in the better types, to reduce noise to a minimum. Such a provision gives an air of warmth and comfort not obtainable in any other way.

Entrance doors to the individual flats should be at least 2 ft 9 in. in cheaper types and wider or double in other types. These doors are often required to be self-closing and fire-resisting, to cut off the staircase hall from each flat in case of fire in either place. The entrance doors should be separated as much as possible from one another to give the maximum amount of privacy.



FLATS . DIAGRAM SHOWING VARIOUS POSSIBLE NUMBERS OF FLATS SERVED FROM ONE STAIRCASE & METHODS OF 2NDY ESCAPE :

Figure 8

Entrance Halls—Figure 9 shows in Diagrams A and B two entrances of minimum desirable widths for lower rental types where lifts are not required. The two types are similar in most respects, but if the staircase has to be placed at the rear of the block an entrance, as shown in B, is needed, which permits the introduction of a draught lobby. The overall width is 8 ft in each case, with a staircase 3 ft 6 in wide, but this is frequently reduced to as little as 7 ft 6 in or even to 7 ft.

In both examples basement access is possible if required, or the space may be occupied by a cleaner's store. A back entrance is possible in Type B.

Figure 9 C illustrates a larger type of entrance, where a lift is required. The staircase, which is suitable for medium-class blocks, but is not desirable for good types. This scheme has an overall width of 12 ft, which is about the minimum possible for the staircase arrangement adopted. This width permits space in the hall for some furniture as shown. The porter is placed under the staircase, to which a back entrance is possible.

Figure 10 illustrates two entrances of more elaborate types suitable for high rental flats. Diagram A is a type having one staircase from which only two flats open, but Diagram B shows a type serving two staircase halls, having two flats approached from each. Diagram A is definitely for a very expensive scheme ; it has a good vestibule and waiting hall cut off from the lifts and ample space at the lift itself. The porter is well placed, being out of the traffic way, but at the same time he can keep control over the entrance, staircase and lift. Type B is typical of a lay-out frequently very useful, where one entrance serves two or more staircase halls, but can be controlled by one porter. The hall or gallery is well lighted from a central area, and is of good width (12 ft). This type is specially useful for luxury schemes with shops on the ground floor or a scheme which has only sufficient area to have two flats placed across the frontage and one on each wing.

Balcony Approach—Balcony approaches are very frequently used for tenement and low rental types, and have been used in a few medium rental types. The balconies are reached by one or more staircases according to the size of the scheme, and from them open the individual flat entrances. It is a very economical method of access, but has the disadvantage that tenants must pass in front of the windows of other flats. This disadvantage is of little importance if the windows overlooking the balcony are confined to living-rooms, kitchens and rooms of a similar nature ; but in no case should they pass bedroom windows. The balcony system can be used in conjunction with maisonettes, so that the balconies may be omitted on alternate floors and therefore cannot pass in front of bedroom windows. Another objection to balconies is the shading of the windows beneath them, though this is not of much consequence. The width of balconies depends partly on the number of flats to be reached, but the minimum and usual width is 3 ft 6 in. They are generally formed by continuing the floor construction to form a cantilever and turning up the outside edge to form the balustrading, which should, preferably, be solid. The staircases connecting the balconies must be cut off from all possible fire risks and when one only is provided, it is sometimes placed in a tower, cut off from and on the opposite side of the balcony to the flats. Staircases may often be placed in dark corners of courtyards and are usually connected together by continuous balconies at the third-floor level to provide alternative means of escape. Part of Figure 11 illustrates the plans of the usual arrangement of balconies, with continuous balconies connecting two staircases at the third and upper floor levels, to permit of secondary means of escape. The remainder of the figure shows three alternative sections frequently adopted. Type A, the most usual, has flats on the lower three floors and maisonettes occupying the upper two floors. This system requires balconies at the first, second, and third floor levels and a parapet gutter (minimum width for this purpose should be 12 in.) or small balcony at the fifth floor level for escape purposes. Type B has flats on the ground floor only, with four floors above occupied by two maisonettes, thus requiring only two balconies ; but it is doubtful whether this arrangement is any more economical than Type A, owing to the cost and space required for the internal staircases needed to reach the upper floor of each maisonette. Type C has only four stories occupied by two maisonettes requiring only one balcony. The fifth floor is occupied by a drying-room for washing. It is very doubtful if this scheme is very economical, as the wall thickness for four or five stories is generally allowed to be the same and one extra floor of accommodation is more economical, having regard to the return of rental, etc.

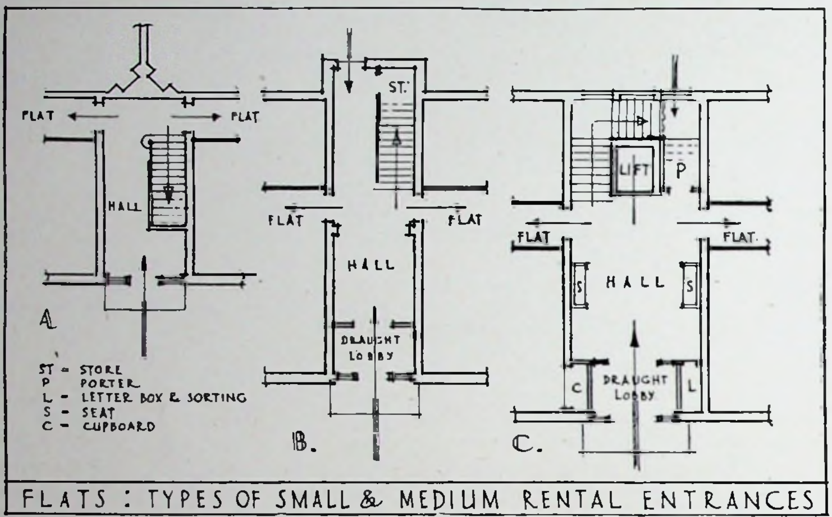


Figure 9

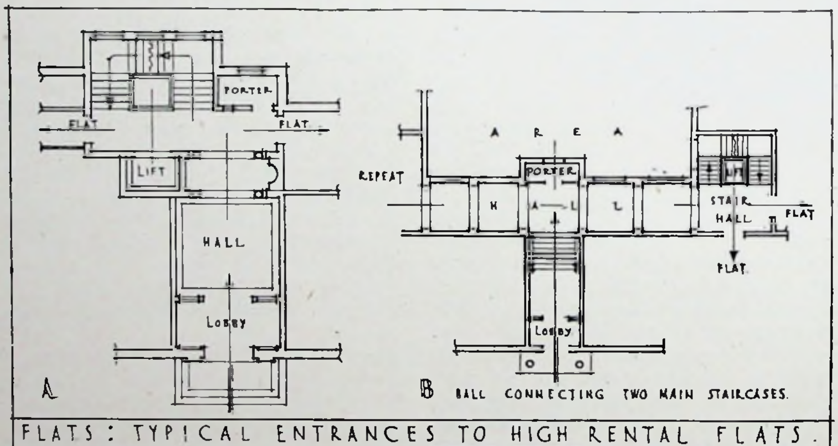
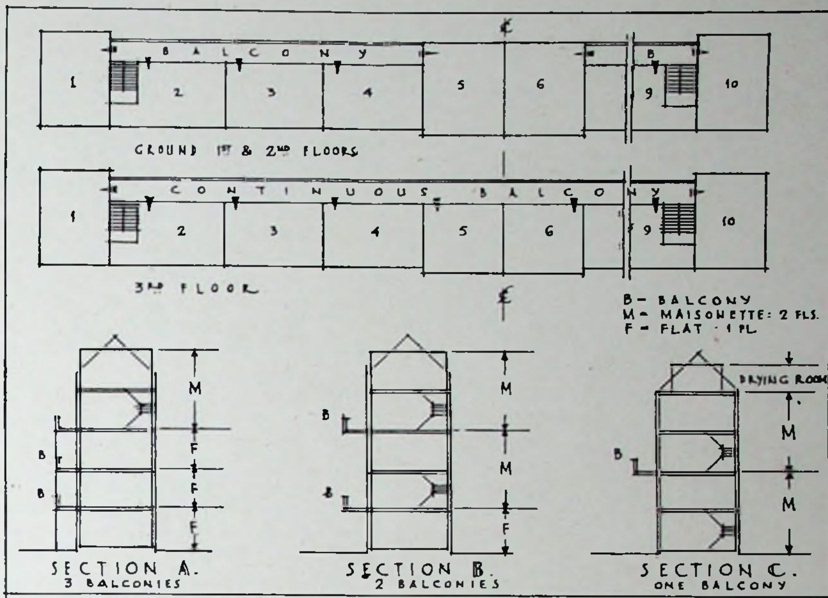


Figure 10



FLATS : DIAGRAMS SHOWING FLATS & MAISONETTES WITH BALCONY APPROACHES, & POSITIONS OF STAIRCASES

Figure 11

Service Entrances, etc.—The service entrances and staircases provide not only secondary access for staff and tradesmen, but also allow a secondary means of escape and therefore they must be designed to satisfy the fire authorities. Service staircases are not required for tenement or low rental types and in these all deliveries must be made to the main entrances to the flats. In all better-class flat blocks it is essential to separate goods from general circulation. Occasionally blocks of flats have been built where the service staircase and lifts deliver on to the main circulation corridors and it is a method very much criticised by tenants. Service entrances should be well separated from the main entrances and, if possible, be approached from secondary streets or private access roads. Good and easy control of the entrances is essential as a safeguard to tenants against tramps, burglars, etc.

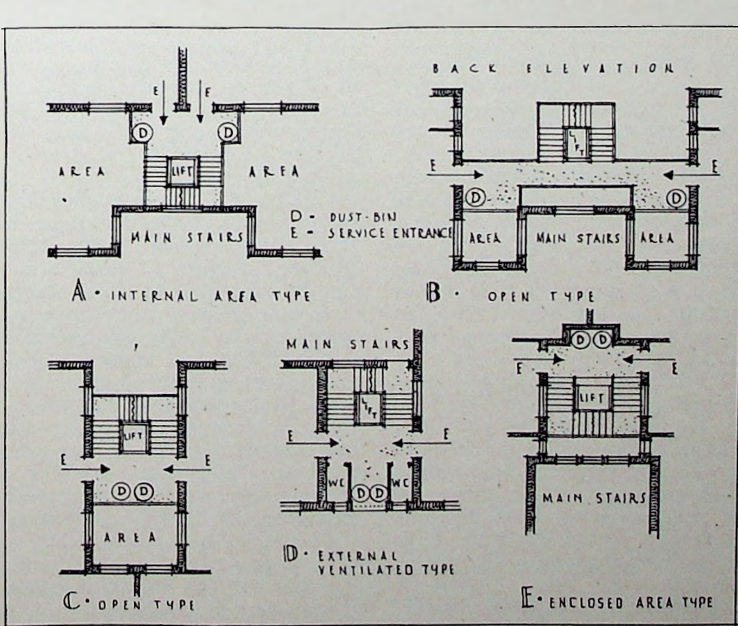
Service staircases and lifts should deliver as close to the kitchens as possible, to give easy access both for tradesmen from outside and for tenants working in the service portion of the flats. Dustbins are often accommodated on the staircase landings, but must be kept clear of the circulation. The staircases should be at least 3 ft 6 in wide have treads not less than 9 in and risers not more than 7 in; winders should not be used. Service staircases may be of any fire-resisting materials, such as concrete or metal, the selection of which is generally dependent on the position. External ones are generally metal, especially if placed in areas, so as not to obstruct more light than absolutely necessary. Iron staircases are, however, rather noisy and are therefore disliked by many tenants.

Service lifts are needed for all better types of flats, even if only three stories high; but if they have to serve four or more floors, they should be power driven. Lifts of small dimensions carrying loads of about three or four hundredweights are sufficient except for high rental types, where lifts sufficiently large to carry all ordinary pieces of furniture should be installed to eliminate possible damage to passenger lift cars which otherwise have to be used for such purposes.

Service staircases must have daylight and natural ventilation, or they must be placed externally, in open areas or light wells. Figure 12 shows various common arrangements of service staircases and lifts in relation to the kitchen entrances of the flats. It should be noted that frequently the secondary access can be arranged very conveniently behind the main staircase, as in Examples A, B, and E. The lifts are generally most easily placed in a well with the staircase round it. A service staircase can seldom be arranged to serve more than two flats on each floor. Type A shows a usual arrangement of placing the staircase in an internal area and enlarging the platform to accommodate the dustbins. Type B is an ordinary escape staircase placed between two projecting wings and connected by platforms to the flats at each level. The platform is kept away from the window of the main staircase to reduce the obstructions of light and the risk of fire making the platform impassable if the main staircase window breaks under excessive heat; the platform is widened near the entrance doors to accommodate the dustbins. Type C is similar to B except that the buildings are closer together and less platform is required.

Type D is frequently used when the service staircase must be placed on a main façade; it is enclosed entirely within the building. It is lighted and ventilated by an enlarged opening, in front of which the dustbins are placed. It also overcomes, by being in a ventilated area, a difficulty often met with in the placing of the secondary W.C.s.

Type E is suitable for a very crowded site, the staircase being placed in an internal area, which it occupies almost entirely. In such a case an iron staircase of a type permitting the maximum amount of light to pass through it is essential.



FLATS : TYPES OF SERVICE STAIRCASES, LIFTS ETC.

Figure 12

Service-rooms—The amount of space needed for accommodation of communal services varies very much

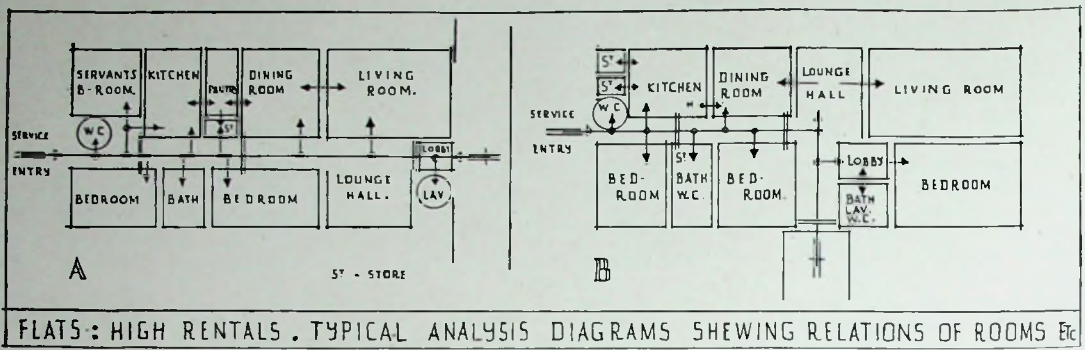


Figure 13

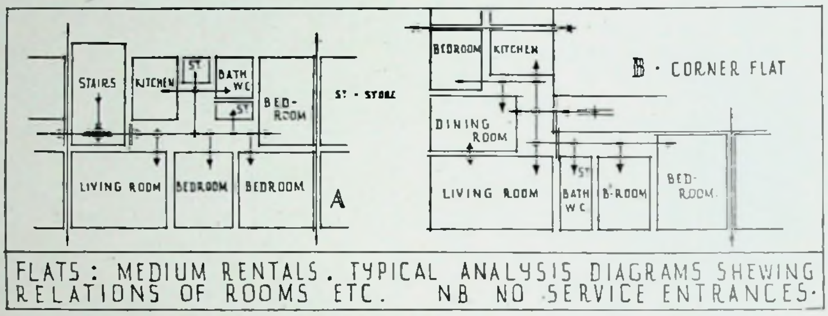


Figure 14

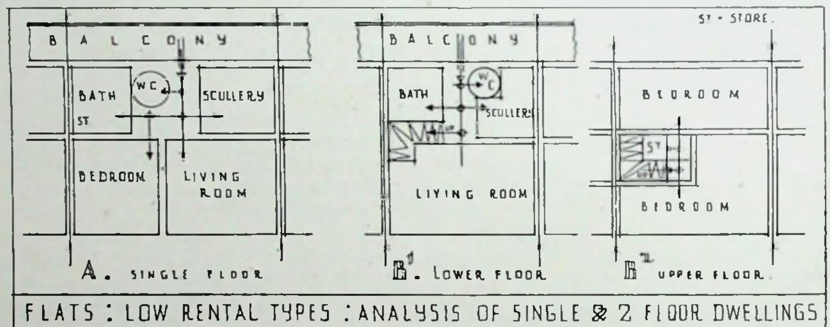


Figure 15

according to the type of flat required in any scheme. Tenements and low rental classes seldom need very much space for boilers, but, on the other hand, they need drying-rooms for laundry. Better-class schemes need spaces for boilers, fuel, a small workshop, transformer and meter-rooms, porters' and cleaners' rooms, and some storage space. All these rooms may be placed in basements where excavation is possible. In addition to the communal service-rooms, storage space for such articles as fuel and trunks is frequently needed for the individual flats. Artificial light is sufficient for these rooms, as they are little used but good ventilation and dryness are essential. Trunk-rooms varying from 60 to 100 sq. ft. in area are amply large enough if properly fitted with racks. Fuel stores, if they have to be provided outside the flats themselves, as is often the case, need not hold more than half a ton, as it is seldom that there are more than two coal fires in each flat. Half a ton of coal can be placed in an area 6 ft by 4 ft if stacked 3 ft deep behind coal boards.

Individual Flats: Grouping of Rooms—Aspect for rooms frequently presents difficulties in flat-planning; ideal aspect cannot always be given to all rooms, but preference should be given to living-rooms. Considerable attention usually has to be paid to the grouping of services, and the concentration of drainage and plumbing is one of the most important factors.

The accommodation in a flat may be classed under three headings, living-rooms, bedrooms, and service-rooms, the last including kitchens and maids' quarters. These groups should be carefully related each to the other and each room in each group related to the other rooms in the group. Bedrooms, together with bathrooms, are essentially for the use of the inhabitants of a flat only and should therefore be cut off as much as possible from living-rooms to which guests have access in addition to the tenants. Living-rooms should adjoin entrances to flats, but should not, excepting in tenement schemes or in the case of lounge-halls in better classes, become corridor rooms. In tenement schemes great economies may be derived by entering rooms directly from the living-room, since all corridors and their cleaning are eliminated; but such an arrangement is apt to make the living-rooms cold and draughty, besides being rather unhealthy and unpleasant, especially if cooking is done in them and it should not be necessary to enter the living-room when passing from a bedroom to a bathroom. Such an arrangement is only satisfactory for small flats with not more than one or at the most two bedrooms. It is an advantage to group the living-rooms in a suite and open them from each other. Dining-rooms should be placed so as to avoid service from kitchens having to cross halls or corridors. The service group and domestic staff quarters should form a link between dining-rooms and service entrances and in higher rental flats servants should be able to reach front doors without passing through or disturbing living-rooms.

The greatest economies of internal planning and space-saving are gained by the reduction of corridor and connecting spaces to a reasonable minimum, but excessive elimination generally reduces privacy and comfort. Living-rooms should always be placed near entrances and not so that visitors have to pass the doors of bedrooms and bathrooms.

Figures 13, 14 and 15 show typical analysis diagrams of the relationship of the various rooms in different types of flats. Figure 13 illustrates two high-rental types, of which Type A is the better. The entrance is through a small draught lobby (with a lavatory attached) into a lounge hall. The living-room is entered directly from the hall, as also is the dining-room, the latter having direct communication with the living-room on one side and the lounge on the other. The main bedrooms are grouped round the bathroom and cut off from the remainder of the flat. The kitchen is close to the service entrance and has its pantry on one side and the maid's room on the other, all of which again form a group cut off from the remainder of the flat. Each of these types, owing to the use of a lounge hall, has natural lighting

for the entrance and internal corridor. Type B in Figure 13 is less well arranged, as service from the kitchen and ordinary bedroom quarters has to cross the entrance hall to reach the main bedroom, the private bathroom attached has to serve also as cloakroom for the hall. Figure 14 shows two typical lower medium-class flats without separate service entrances. In Type A corridor space is reduced to a minimum and arranged to do away with any appearance of being a narrow passage ; whereas in Type B there is a considerable amount of space occupied by access corridors. Type A is small, having one living-room used also for dining purposes ; the fault in this lay-out is the necessity of food service having to cross the hall ; this, however, can seldom be avoided. Type B has the rooms well grouped together and each group may be cut off satisfactorily. Figure 15 illustrates the low rental class of flat based on the balcony approach which is so commonly adopted for tenement schemes. Diagram A shows the typical plan used for the lower three floors and Diagram B1 and B2 the two topmost floors planned to form a maisonette. The arrangement of the rooms is similar in many respects to other types, but the slightly different uses of the rooms must be borne in mind, while economy of space and equipment are primary factors.

Heights of Rooms—Tenement and low rental class flats generally have rooms with a clear height of 8 ft 6 in from floor to ceiling, although they are sometimes reduced to 8 ft 3 in and even to 8 ft ; in some districts, where rooms are placed in roofs, they are frequently only 8 ft in the clear. For medium-class schemes a general average is 10 ft from floor to floor, so that the rooms are about 9 ft 3 in. in the clear, depending on the type of floor construction adopted. In luxury types greater heights are desirable, and a common unit is 11 ft 6 in from floor to floor, but frequently this is not obtainable, as the high site cost makes it essential to have the maximum number of floors to produce an economical scheme in the total height of the building allowed by Building Acts.

Entrance Halls to Individual Flats—In tenement and low rental types space does not permit an entrance hall to be formed, and it consists of the minimum passage-way (usually about 3 ft 6 in wide) necessary to give access to the various rooms, but in all other types a small hall is desirable where callers may wait and to provide accommodation for hats and coats, telephone, etc. The hall is sometimes enlarged to form a lounge in the larger types, but the room thus formed is often impossible to use for sitting-room purposes, owing to the numerous doors into other rooms making the hall a passage-room, and therefore somewhat uncomfortable. Where only one living-room is provided, lounge halls are frequently used as dining-rooms, to prevent the smells of cooking being admitted to the only sitting-room ; any room used for such purpose must have adequate daylight. Coat cupboards are of importance in all entrance halls, while the higher rental types need also a lavatory and W.C. Coat cupboards should be at least 12 in deep and in multiples of 21 in wide if coats are placed against the back wall, or 21 in deep inside if coats are hung at right angles to the back wall. Shelves are needed for hats.

Corridors—Internal corridors or passages should be reduced in length to a minimum. It is seldom economical to plan a flat so that the access corridor is properly lighted by windows, but the space so saved and consequent reduction of the flat rental seems to justify the cost of artificial lighting and the lack of direct ventilation. Borrowed light, however, may often be provided by glazing living-room doors with obscured glass or by fanlights placed over some of the doors. Corridors should be at least 3 ft wide, and 3 ft 6 in is much more satisfactory, as it is difficult to turn furniture into doors from narrow passages. Floor materials should be chosen to reduce noise and for durability.

Individual Rooms—The planning and general arrangement of domestic rooms have already been considered in the Section on "The House" and therefore only additional points particularly applicable to flats are discussed in this section. Shapes and sizes of rooms often cannot be ideal, owing to economies of construction and lay-out of services, but many of these difficulties can be overcome by close study of detail planning. As flats are planned for the unknown client, all eccentricities should be avoided and the plan should be evolved round the requirements of typical tenants of each particular class of flat.

Living-rooms : High and Medium Classes—In most medium and high-class flats only one living-room is generally provided in addition to the dining-room. The size will vary according to the type and class of flat, but it can be assumed that about 175 sq. ft. is the minimum area for a satisfactory living-room, always provided that the least dimension is not less than 12 ft, but, as shown in table of average room sizes, the average floor area is 325 sq. ft. in high rental, and about 300 sq. ft. in medium rental schemes. In general all living-rooms should be of reasonably simple shape, without an undue number of breaks or recesses in the walls on plan. A certain amount of shaping by internal "trim" is allowable, but circular, niche-ended, octagonal, or eccentrically angled rooms are difficult to furnish and to fit with carpets, and are, therefore, less acceptable to tenants. In luxury types living-rooms may be made slightly in excess of the area really necessary, thus enabling the individual tenant to reshape the room as desired without cutting down the floor area to an unreasonable degree.

The living-room can be connected to the dining-room (or lounge hall) with folding doors to enable a large area to be available when required. Such doors are inconvenient as the normal access to rooms, and, if possible, an ordinary single door should be provided in addition, which may connect with the hall or the internal corridor.

The living-room in low rental classes usually has to serve also as dining-room, especially when the kitchen is too small to permit of accommodation for meals. Owing to this combined use, an area of approximately 225 to 245 sq. ft. is the minimum satisfactory range.

TABLE OF AVERAGE ROOM SIZES.

Compiled from past examples and from the Housing Manual (1944)

Class of Flat	Room	Average area in sq. ft.	Minimum desirable dimension (width)
High Rentals	Living-Room	325 ...	15 ft
,, ,,	Dining-Room	270 ...	14 ft
,, ,,	Bedrooms (Large)	270 ...	15 ft
,, ,,	Bedrooms (Small)	120 ...	9 ft
,, ,,	Kitchens	175 ...	12 ft
Medium Rentals	Living-Room	300 ...	15 ft
,, ,,	Dining-Room	225 ...	14 ft
,, ,,	Bedrooms (Large)	220 ...	13 ft
,, ,,	Bedrooms (Small)	100 ...	8 ft 6 in
,, ,,	Kitchen	150 ...	11 ft
Low Rentals	Living-Room	170 ...	11 ft
,, ,,	Kitchen-Living-Room ...	190 ...	11 ft
,, ,,	Living-Room (no dining space)	190 ...	11 ft
,, ,,	Living-Room (with dining space)	230 ...	11 ft
,, ,,	Bedroom (double)	145 ...	11 ft
,, ,,	Bedroom (other double) ...	115 ...	10 ft
,, ,,	Bedroom (single)	75 ...	8 ft
,, ,,	Kitchens (working type ...	95 ...	8 ft

Heating—Opinions vary considerably as to the advisability of providing solid fuel fires for heating in the low rental type of flat. Central heating is usually too costly, and makes rentals too high, and, therefore, some other form of heating is necessary, and preference at the moment seems to be on the side of solid fuel fires, which complicate planning and construction owing to the necessity for providing flues and fuel stores. The latter are eliminated by the use of gas and electric fires, but many tenants still seem to prefer the coal fire with its attendant work and dirt to other forms of heating, unless the alternative fuel costs are very low. "District Heating" by means of central plants burning coke or using electric-thermal storage or heat-pump methods may eventually enable full or partial central heating throughout large development schemes.

If any open fireplaces are provided, the coal type, requiring a full-size flue, will, generally, be needed only in the living-room. These rooms, therefore, will be more convenient and economical in flue arrangement if placed one above the other on each floor.

For flats of higher rental types central heating is now an essential provision in all living-rooms, either in the form of radiators or panel heating, but some method of additional heating is usually necessary either in the form of solid fuel, gas or electric fires.

Lighting—Lighting in low rental types must consist of ample daylight provided by windows, preferably placed on the long side of the room to allow of division, when arranging furniture, into sitting and dining sections. There is a tendency in many schemes to save money on the number of electric light points provided in living-rooms of this class. A central pendant is essential, but at least two plug points should be provided in addition.

Windows should be of ample size, especially in town areas and particularly for windows placed overlooking areas or courts on congested sites; here the usual ratio of 1/10th floor area should be increased to 1/7th or 1/8th. Two windows are better than one in a living-room, as ventilation is more easily regulated and adjusted to circumstances.

Artificial lighting should be of two varieties. Local lighting is tending to become increasingly popular and therefore several skirting plug points for table or standard lamps should be provided, though at the same time a general lighting system is also needed. The latter may be indirect, by means of cornice lighting, which is expensive, or by means of central ceiling points or wall lights, with a switch near the entrance door to the room.

Dining-rooms—Separate dining-rooms are provided in high and medium rental types, but only occasionally in the better flats in low rental class. The position of the dining-room is important to save labour and eliminate discomfort ; it should be grouped between the living-rooms and the kitchen quarters and away from all bedrooms. It is more satisfactory if service does not have to cross the main corridor of the flat, but this is frequently difficult to achieve.

The circulations of a flat dining-room are twofold—to and from the kitchen and to and from the rest of the flat. The kitchen service connection in the smaller types may be by means of a corridor or a lobby to the kitchen, and the latter becomes a combined pantry and working kitchen, but in the larger types the service pantry between the kitchen and the dining-room is almost a necessity.

Dining-rooms in high rental types average about 270 sq. ft. in area, and should have a minimum width of 14 ft, while in the medium rental class the rooms average about 225 sq. ft.

A built-in sideboard is a great asset to letting and a hatch, if considered desirable, may be incorporated in this fitting.

When dining-rooms are provided in the better flats of a low rental scheme, the rooms should not be of less width than 12 ft to allow of comfortable circulation space for service on all sides of the table. The superficial area of the room will largely depend on the size of the remainder of the flat, but the length of a 12-ft wide room should be about 14 ft to dine six persons in comfort.

Heating—As central heating is usually provided in the types of flat having dining-rooms, radiators or panel heating are sufficient for the usual use of the room. Provision should, however, be made for auxiliary heating by means of gas or electricity. Such fires should, if possible, be placed at the side of the room, so as to allow one end wall to be used for sideboards and the other for folding doors communicating with either the lounge hall or the living-room, the fourth side of the room being required for windows.

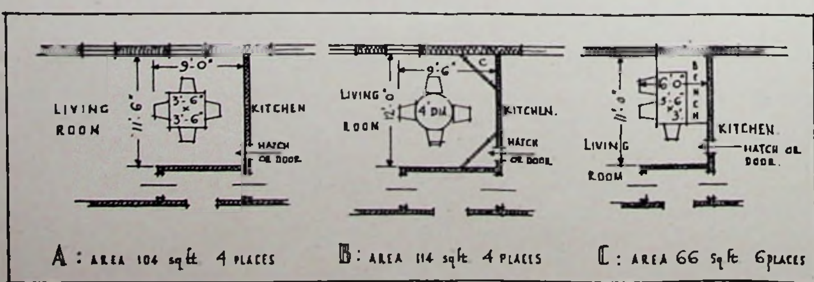
Lighting—Artificial lighting of the dining-room should be by general lighting, with auxiliary floor points for lighting the table and sideboard.

Dining Recesses—In some schemes where there is no separate dining-room, dining recesses are provided so that the table does not interfere with the free space of the living-room.

Figure 16 illustrates three typical dining recesses of minimum dimensions. Diagrams A and B are large enough to permit of service round the table on all sides, but Type C, which is much more economical in space owing to the built-in bench or seat, and accommodates six persons instead of four, is only slightly more than one half of the floor area of the other examples. In each case a hatch giving direct communication with the kitchen may be installed if desired.

Bedrooms—Bedrooms should be given, as far as possible, quiet situations in relation to surrounding roads ; but the more important ones should only overlook internal areas or courts if the latter are large and do not provide a bad outlook on to such things as service staircases. The general planning requirements for bedrooms are the same for flats as for houses, and, as these have been covered in the Sections on "Housing" and "The House," only special points affecting flats will be dealt with here.

High Rental Classes—Bedrooms in this class of flat may be subdivided into three types, principal, secondary and those for maids. The first category usually have a private bathroom attached to each, and certainly in the case of the main bedroom, which frequently has a small bedroom or dressing-room in addition, to form a suite. In the second category the rooms should be grouped with a bathroom, while the third are placed as a separate unit with the kitchen, again having a bathroom of their own. In medium rental classes having three to five bedrooms it is important that at least two of the rooms are large enough for double beds. The average size of the main bedroom in a high rental scheme is about 270 sq. ft., and in a medium rental scheme about 220 sq. ft. The smallest bedrooms, which are those for servants, average about 120 sq. ft. in high rental flats and 100 sq. ft. in medium classes, although there seems little need for these to be more than 80 sq. ft. in area if they are each used for one maid only.



FLATS : DINING RECESSES IN SMALLER TYPES, MINIMUM SIZES, ETC.

Figure 16

Heating—Central heating is generally provided in bedrooms of this class, but secondary heating, such as gas or electric fires, is usually provided in addition.

Lighting—Ample artificial lighting points are essential for all main and secondary bedrooms, both for general and local lighting for the bed and dressing-table.

Lavatory Basins—It is general in all better-class schemes to equip each bedroom with a lavatory basin, except in rooms having their own private bathroom attached. A few tenants dislike having basins in bedrooms, but the majority appreciate the work saved and they are particularly popular in medium rental types with proportionately fewer bathrooms.

Low Rental Classes—In this type, if two bedrooms are provided, sometimes only one is made large enough for a double bed, but it is better to have two large rooms when three bedrooms form the sleeping accommodation. As only one bathroom is usual with this number of rooms, it should not be attached to any special room, although it is more convenient if placed close to the largest room, which is the one in most continuous use. The average size for the main bedroom is about 145 sq. ft., but the least dimension should be not less than 10 ft 6 in or, better, 11 ft. The smallest bedroom should not be less than 70 sq. ft

Heating—Central heating is very seldom provided in bedrooms of low rental flats and, therefore, some provision for heating should be made in all rooms ; electric or gas fires are the most general, with possible provision for the use of solid fuel in the main bedroom.

Lighting—All bedrooms should have at least two artificial light points, one for general lighting and the other for local lighting over the bed itself, the latter controlled at the bed-head.

Cupboards—Built-in wardrobe cupboards should be provided in all bedrooms, if possible. The minimum cupboard space for a single room is 2 ft in width, 1 ft 8 in to 1 ft 10 in. in depth, carried to the full height of the room, with an upper cupboard above a height of 6 ft 6 in.

Dressing-rooms — Dressing-rooms are, generally, only provided in two types of flat schemes. Firstly, in luxury types where they are similar in all respects to those in houses. Secondly, they are used in conjunction with bed-sitting-room types (see also "Small Flats") which generally raise problems as to the storage of clothes, etc. Figure 17 illustrates two examples of the small dressing-room ; Type A being for a better-class flat, and Type B for use in conjunction with a bed-sitting-room. In each scheme a bathroom is entered through the

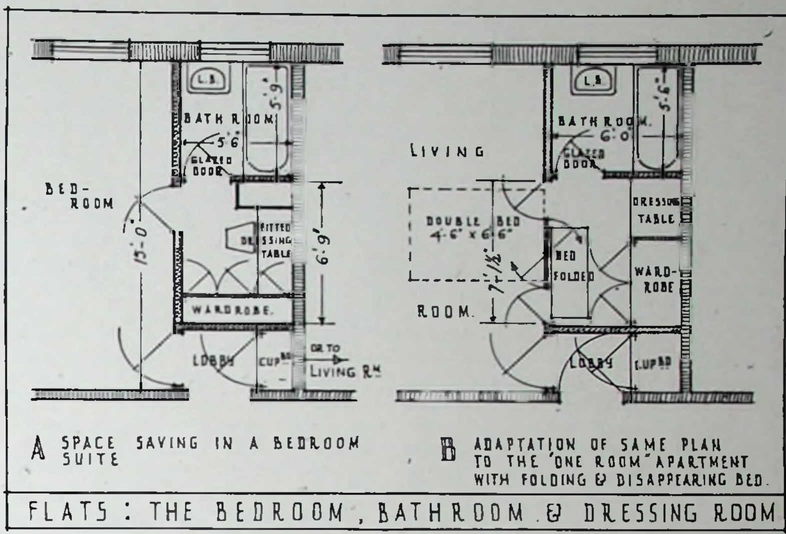


Figure 17

dressing-room, which is now permitted in most districts, as its use is limited by its situation to the one bedroom ; but, if required, it is possible to ventilate the dressing-room over the bathroom and thus make it a ventilated lobby. A W.C. may be placed in either bathroom in most districts. In both examples, the dressing-room has to depend mainly on artificial light, but this need not be a very great disadvantage if properly designed equipment is used, as the room is only occupied for very limited periods during the day. Type B incorporates the folding and disappearing bed.

Bathrooms—The number of bathrooms required for each flat depends entirely on the type of scheme. Luxury flats frequently have one to each of the large bedrooms, one for the smaller bedrooms and one for the use of the maids. Middle-class rental types usually require at least two, one being attached to the servants' quarters ; if, however, one only is provided for the bedrooms, other than those for the servants, it must not be attached to any particular room. In better-class types, bathrooms are not as a rule made the minimum dimensions, but in all other types the more space saved the better, so long as the baths are not less than 5 ft 6 in overall.

Low-rental types sometimes have the bath placed in the kitchen or scullery, but this should only be permitted in types having not more than two or three bedrooms, and only when the adult occupants do not number more than two.

W.C.s—Opinions vary as to the desirability of placing W.C.s in bathrooms. When only one is provided it should be separate, and if more are provided in large-type flats at least one should be separate. It is a good principle to provide a separate W.C. for the use of servants, which may be satisfactorily placed in the maid's bathroom, except in very large types where many servants are required It is now generally conceded that the W.C. (if the only one) may be included in the bathroom where the flat contains only two bedrooms or less.

Artificial Ventilation of Bathrooms—Mechanically ventilated bathrooms which have been so common in American cities for many years, are now permitted in some districts in England, but the initial and upkeep costs of a mechanical ventilation plant are such that they are not an economic proposition except on very crowded and expensive sites and where buildings are the full height allowed under the Building Acts.

Equipment of Bathrooms—The equipment and selection of fittings vary with rental value. High rental types must have fittings of very good quality except in maids' rooms ; while low rental types may have the cheapest available, always provided that the fittings are suitable for hard wear and rough handling. Bathrooms which are private to one bedroom in luxury types, usually have a complete suite of four fittings, but bidets are at present seldom used elsewhere. Maids' bathrooms generally have only a bath and W.C., as wash basins are generally placed in each bedroom. Combined fittings consisting of lavatory basin and bath, the former discharging into the latter, are sometimes used in low rental types.

Kitchens, etc—Kitchens vary in floor area according to the class of flat, although the difference is not so great as in other rooms ; high-rental, luxury-flat kitchens have an average area of 175 sq. ft., with a pantry in addition, whereas the medium-rental ones average about 150 sq. ft., but are often without a pantry. In low-rental schemes, however, the kitchens are usually reduced to the minimum area into which the necessary equipment can be placed, thus averaging

95 sq. ft. in area; it is, however, possible by very careful selection and design of fittings, to reduce this area to as little as 40 sq. ft. for small one-room flats and for bed-sitting-room types to what is virtually a large cupboard. The general lay-out of kitchens was discussed in the Sections on "Housing" and "The House" therefore only special points for flats and the very small types are here considered in detail. Figure 18 illustrates a typical example of the lay-out of the servants' rooms, kitchen and pantry for a luxury scheme. Direct approach is given from the service staircase and lift to the kitchen, and a good lay-out of fittings for sequence of process in food preparation is arranged, with the refrigerator and larder adjoining the entrance door. Adjoining the kitchen is the service pantry, with which is grouped the maid's bathroom to facilitate plumbing and other services. Figure 19 shows a typical lay-out for the scullery for low-rental types. The cooking in low-rental types is usually done in the kitchen, by means of gas or electric cookers. Low-rental types usually need a wash-boiler as separate communal laundries do not seem popular among tenants.

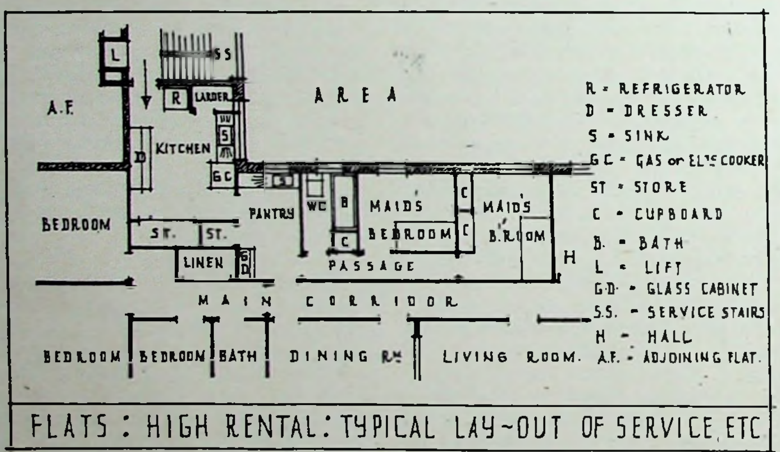


Figure 18

Larders—The provision of a larder with natural ventilation often presents a planning difficulty. These are required in all types, even where refrigerators are standard equipment, but windows are not always provided, reliance being placed on air-bricks at the top and bottom. Larders which are simply cupboards in small, hot kitchens are not very satisfactory, and in such cases it is better if they are entered from outside the kitchen.

Kitchenettes—The kitchenette has been developed very considerably for smaller types of flats, especially for those having only one or two rooms or where maids will not be employed. The working efficiency of these small kitchens is mainly dependent on the complete and proper provision and placing of equipment.

The floor space provided is not so important as careful design of fittings, and the reduction of space occupied by the use of such equipment as folding tables, ironing boards which fold into shallow cupboards in the thickness of a partition, and small refrigerators which fit under sinks or into part of a kitchen cabinet or built-in cupboard.

All available space on walls and floors should be used for the placing of equipment, as may be seen from Figure 20, and the clear floor space for working reduced to a minimum; even the ceiling may be used for the hanging of an "airing rail." Figure 20 illustrates a kitchen of very small area —49 sq. ft—but, owing to careful placing of fittings, it is quite satisfactory for its purpose. The cost of equipment for such a kitchen is fairly considerable, but by careful selection and designing it will be found to be far less than would appear at first sight, particularly as there would be much repetition if a whole block of flats were to be similarly fitted up. The main equipment consists of a cooker with a ventilated hood over, which is particularly desirable in all small flats, a sink and draining-board under which the refrigerator is placed, a folding ironing-board, a broom cupboard and a kitchen cabinet which has a sliding top and eliminates the necessity for a table.

Heating—Large kitchens generally require some heating other than that provided by the cooking range, especially if the room is to be used also as a maid's sitting-room, so that radiators should be installed when central heating is available and in its absence a gas fire or electric radiator plug-point should be provided. A gas cooker fitting which includes a small, open gas fire for heating the room is now on the market. Small kitchens, since they are not used for sitting-room purposes, do not require any heating, as the warmth generated by cooking is usually more than sufficient; but, if central heating is available or a gas or electric water heater has to be installed in the absence of a central system of hot water supply, advantage may be taken of it for heating the room and drying tea-towels, etc. Some such means of drying kitchen linen should be considered essential.

Lighting—Kitchens require careful thought in the placing of light fittings to avoid shadows on working surfaces, such as tables, sinks, and cookers. Efficient lighting can seldom be obtained from the usual single ceiling pendant in the centre of the room, and some bracket points are needed in addition, especially in the larger types.

Points, either gas or electric, are needed for the cooker, refrigerator, iron and (in the lower rental types) for a wash-boiler.

Special Equipment—In the larger types the equipment is similar to that needed in the kitchen of an ordinary house, excepting that it usually requires more careful arrangement, as there is less available floor space. In the smaller types, however, special equipment of a space-saving nature is particularly needed to economise floor area as much as possible. Each fitting must be designed for its exact purpose, and proper provision made for the contents of each. There has been a recent extensive development of the kitchen cupboard into the fitted cabinet, which may still be extended considerably before it is as complete as the equipment developed in other countries; where, for instance, a fitting may be obtained containing a cooker, a sink and draining-board, refrigerator, folding table and cupboards for stores, china, glass, linen, brooms, etc., the whole being about 6 ft in length, 1 ft 9 in deep, and 7 ft high. Many articles of equipment are already made in this country for building into fittings, such as the refrigerators mentioned above, which will fit either under sinks and draining-boards or into cupboards. Sinks and draining-boards are also now made in one piece and gas and electric cookers, which have the oven and boiling ranges side by side, high enough to fit over a pot cupboard, are now being sold.

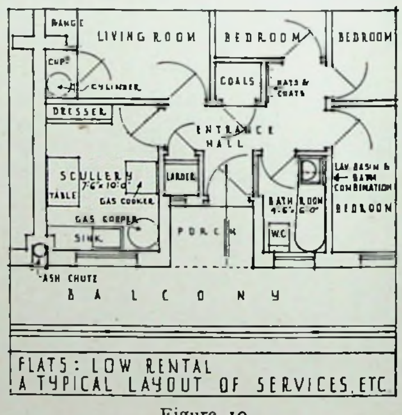


Figure 19

Stores, Cupboards, etc—Ample and suitable storage space is essential in every type of flat, but especially in

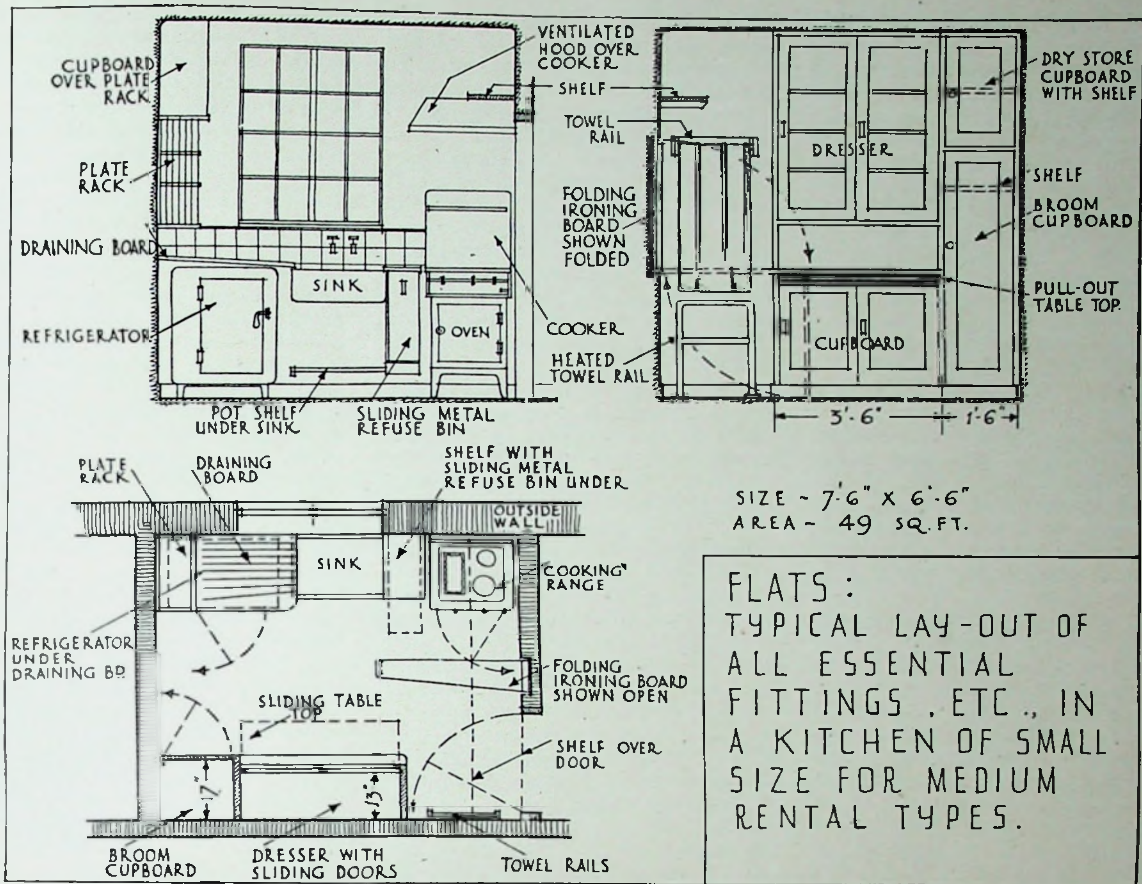


Figure 20

those of higher rentals. Ordinary houses have accommodation such as box rooms and roof spaces, but such space does not occur so readily in economically laid-out flat plans. Cupboards for various purposes, for clothes, linen, wine, etc., may frequently be arranged opening from the main internal corridor of each flat and placed between cupboards or wardrobes needed inside the rooms, thus forming an insulated barrier between the rooms and corridor noises, with a consequent saving on wall thicknesses, etc. (Figure 21.) The placing of cupboards in these positions is specially useful in the bed-sitting-room type, with centre corridor approaches, as in this case, of course, the corridors are public thoroughfares.

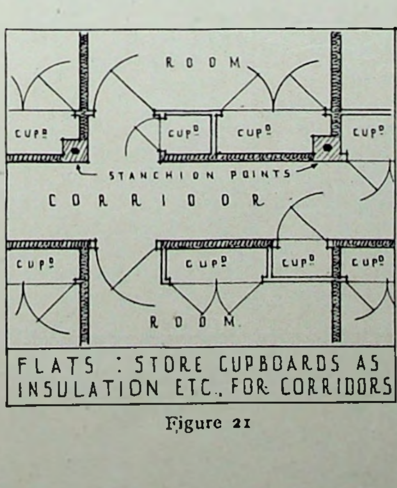


Figure 21

Cupboards in these positions also frequently help to provide unseen accommodation for the stanchions of the steel frame.

Cupboards for general purposes should not be too deep, but fairly wide; a good average depth is 2 ft, but at least one deeper store is desirable for suitcases and large articles. Additional storage spac e isfrequently provided in the basement, and leased separately to tenants for storage of large articles such as spare furniture and trunks. It is essential that such storage should be well ventilated and dry. These stores should have an area of at least 40 sq. ft., each with solid partitions between them, and should be fitted with strong shelving.

Fuel Storage—Fuel storage presents one of the difficult problems of flat design. If it is placed inside individual flats, much dirt and dust are caused, delivery is complicated and suitable storage accommodation is difficult to provide; this system, however, has to be adopted in the lower rental types, where porters are not available to carry the fuel from basement stores. The actual accommodation is provided in the form of bins or cupboards generally placed in or off corridors. The bins are usually about 2 ft 9 in wide, 1 ft 6 in deep, and 3 ft high, which is sufficiently large to hold 2 cwt of coal. The bins should be constructed of galvanised iron or framed up in wood and lined with sheet iron. Cupboards, when used for fuel, should be fitted with removable bunker boards and lined with sheet iron, unless the partitions are of brick. Solid floors are essential.

Unless a central hot-water system or local heating such as gas or electric geysers or circulators are installed, coke storage for independent boilers may be required in addition to that for coal. The amount of fuel storage required in all types is comparatively small, as usually few coal-burning fires are installed, and even in the large types where several open fires may be provided, few are regularly used owing to central heating being normally adequate. In better types fuel is stored in the basement and carried to the flats daily by the porters; this storage is worked on one of two systems, either small individual storage for each flat or bulk storage, from which the fuel is sold per scuttle to the tenants by the porter. The latter is more simple from a planning point of view, but is unpopular with tenants. When individual fuel stores are provided, about 20 sq. ft. per flat is sufficient when coal boards are used, and this allows for the fuel being stored to an average height of 3 ft, this amount giving a capacity of one and a third tons of coal or, alternatively, three-quarters of a ton of coke.

Refuse—The removal and disposal of household refuse is a particularly

difficult problem which has only recently begun to receive detailed thought. Three general methods of disposal are available, namely, dustbins at each flat level, chutes to basement or ground-floor containers, and chutes to incinerators. The latter have been very little used in this country, although it is a method frequently adopted in America. It consists of a flue running the full height of the building, which delivers into a fitted incinerator with a continuous fire at ground or basement level. Into the flue at each floor level are smoke- and smell-proof inlets to receive refuse which, when the inlet is closed, falls directly down to the fire. In this form its use is mainly restricted to tall buildings, otherwise many separate installations would be required and there would be insufficient supply of rubbish to keep the fire burning. The most satisfactory and least troublesome method of disposal is by means of chutes about 12 or 14 in diameter of glazed earthenware, discharging either into a brick or concrete sump or container which has to be cleared periodically into the local authority's carts. This method is likely to produce unpleasantness unless the sumps are kept clean and well disinfected ; but, alternatively, similar chutes may be arranged to deliver the refuse into small, removable standard trucks (constructed to fit the authority's lorries) about 3 ft wide by 6 ft long and 4 ft high and these are changed by the local authority, usually weekly (Figure 22). The chutes should be carried up so as to be ventilated above the roof level (in a similar way to a chimney), while the interior must have no projections, and must be very smoothly finished, and provision for sluicing the chute from the top from time to time is desirable. Unless the inlets at the various floor levels are very well made and are airtight, they should be placed in the open air and not inside the flats themselves. The other method of garbage disposal is by means of garbage pails emptied twice daily, or larger dustbins emptied daily by the porters into central dustbins for collection by the local authority. Most local authorities insist that dustbins are collected at one place in each block of flats, and refuse to collect from the individual flats, with the result that chutes are being installed in most flats where porters are not employed, as tenants will not be bothered to carry garbage to a general dustbin at the ground floor or basement level at sufficiently frequent intervals.

There are also one or two patent systems of garbage disposal on the market, but they are mostly applicable to very large schemes only.

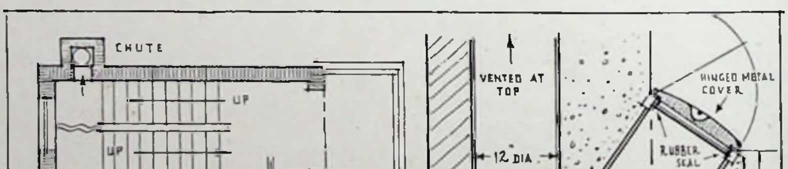
Laundry and Drying-room—While it is general not to provide laundry facilities in high-rental types, it is essential to make such provision in lower rental flats, at least in the form of drying-rooms. Communal laundries, as used so much on the Continent, have been tried in this country, but so far have not proved worth the capital cost. Another reason for the failure of the common laundry is probably that its complement, a communal crêche, is very seldom provided, nor is the expense yet considered essential. Clothes lines on posts are often placed in the courtyards of working-class types, but, in addition, drying-rooms for wet weather are needed and usually the roof spaces of pitched roofs are used for this purpose. These rooms are most satisfactory with solid floors laid falling to gullies and should have permanent ventilation by means of louvred openings. Drying spaces on flat roofs are not very satisfactory in the urban districts owing to the dirty atmosphere and the proximity of flues.

Balconies—Balconies as approaches to flats have already been discussed, but balconies provided as features of the elevation or as an addition to the amenities of a given room are sometimes required. It should be noted in this connection that balconies are very seldom used for sitting purposes, especially in urban areas. When used, such balconies should not extend over two or more flats unless adequately cut off from each other. The chief exceptions to this are the balconies on the sunny aspect for children's cots and prams in low-rental types and where balconies are used as alternative escapes in case of fire.

Roof Gardens—Flat roofs of modern blocks provide an opportunity for the provision of roof gardens, open-air recreational spaces, etc., but smoke-laden air is the chief drawback of this type of development in crowded urban areas. Roof gardens become dirty and difficult to maintain, especially where water is introduced as an ornamental feature of the lay-out.

Equipment—The type, amount and nature of the greater part of the equipment for flats is dependent on the financial aspect of each particular scheme ; there is, however, an increasing tendency to provide more and more equipment each year, both for the purpose of space saving and towards the ultimate reduction in cost of the building and as an aid to letting and a consequent rise in rental return. Certain types, such as flats letting at very high rentals and very small flats for occupation without domestic assistance are usually very fully equipped ; though this is only made possible by the comparatively high rentals in relation to the cubic contents of each flat ; high-rental types must therefore be very fully equipped, whereas the requirements of the lower-priced types will, as a general rule, be less complete and somewhat more flexible, although there is a definite tendency to use more equipment for the purpose of saving floor space, thus ultimately reducing building costs on the total scheme.

Heating—There is a very definite and increasing demand for the provision of central heating partially or throughout flats of all types except low-rental. Many tenants now realize that the extra rental cost for central heating is more than offset by the reduction in cost of additional fuels and has many other conveniences. Heating, when provided, is generally part of a central heating system for the whole block or scheme. In lower rental types heating is often provided only in halls, corridors of individual flats and in public circulations. Few tenants in lower rental schemes seem prepared at present to pay additional rent for central heating, and prefer to have fires, either coal, gas, or electric, meeting the cost of fuel themselves. Central heating is very costly for a cheap scheme if the normal flues for



FLATS : REFUSE CHUTES · A TYPICAL ARRANGEMENT IN THE PLAN, AND A DETAIL OF A HOPPER CONNECTION

Figure 22

individual fires have to be built as well. Consideration now has to be paid in higher rental types to concealment of radiators either in the form of flush wall types or panel heating or by the provision of radiator casings and grilles.

Cooking—Gas or electric cooking now seems generally preferred except in working-class schemes where a small range serves the triple purpose of cooking, room heating and water heating, though in a few working-class schemes central hot water is now being contemplated either to be available in each flat or at least on each balcony level to be shared by a number of flats.

Hot Water—A constant and adequate supply of hot water from a centralized installation is becoming more essential every year and, except in lower rental and working-class schemes, is becoming a general necessity. Low-rental schemes are sometimes equipped with a separate independent boiler in each flat (fuel space involves extra floor area) and in working-class flats provision is made as already suggested ; small localized boilers are preferred by certain types of tenant and the installation costs, together with the necessary plumbing, may be slightly less in first cost and such a scheme does not involve the owners in the bothers of upkeep, complaints of inadequate service, and employment of stokers as would be required in all schemes except those with gas, electric, or oil-fired boilers.

Heated Linen Cupboards—When constant hot water is installed a coil should be placed in all linen cupboards. Heating should be from the domestic water supply as the radiator system is usually cut off in summer time. If constant hot water is not installed consideration should be given to the desirability of installing a gas or electrically operated heater for these cupboards. There is a tendency to make linen cupboards, in fact most cupboards, too small.

Heated Towel Rails—Whenever hot water is available a heated towel rail should be installed in each bathroom for drying towels and when possible, in kitchens or pantries for drying tea cloths, etc.

Coppers—Gas- or electric-heated coppers are desirable in most low-rental and working-class flats, especially as communal laundries have not proved to be greatly used or liked. Drying-rooms or other similar facilities should be provided in tenement schemes and individual (heated) drying cabinets in low-rental schemes.

Lighting and Power—Lighting is generally by means of electricity and care is essential in the placing of points which are for use by changing

	Special small and one room	Working class	Low	Medium low	Medium high	High
Central Heating, all rooms	S	—	—	D	E	E
,, ,, partial	S	—	S	E	—	—
Some open fires	S	E	E	E	S	S
Some gas or electric fires	D	—	S	E	E	E
Rads., cased or concealed	—	—	—	—	D	E
Constant hot water	D	—	S	E	E	E
Heated Linen Cupboard	—	—	S	E	E	E
Hot Towel Rail—Bath	S	—	D	E	E	E
,, ,, ,, —Kitchen	—	—	—	—	D	E
Coppers	—	E	S	—	—	—
Water Softening	—	—	—	—	S	S
Vacuum Cleaning, central	—	—	—	—	S	E
Refrigerator	S	—	M	D	E	E
Phones : between rooms	—	—	—	—	—	D
,, : to entrances...	—	—	—	—	D	E
,, : Post Office	M	—	M	E	E	E
Post chutes	—	—	—	—	D	D
Bells : from entrance	D	S	E	E	E	E
,, between rooms...	—	—	—	S	E	E
Stores, basement	S	—	S	D	D	E
Pram stores	—	E	E	D	—	—
Garages	—	—	M	S	S	S
Balconies (not access)	S	E	S	—	—	—
Floors, Polished	S	—	—	—	D	E
Stairs, etc., carpets	—	—	—	D	E	E
Built-in safes	—	—	—	—	S	E
Bookshelves	D	—	—	D	S	S
Bedroom cupboards	E	E	E	D	S	S
Kitchen Dresser	E	E	E	E	E	E
,, Broom cupboard	S	E	E	S	D	E
,, Ironing Board	S	D	E	—	—	—
,, Drying Cupboard	—	S	M	S	—	—
Drying-rooms	—	E	S	—	—	—
Bathroom cupboard	—	—	—	S	E	E
,, built-in fittings	S	—	—	S	D	E
Servants' rooms (separate lettings) ...	—	—	—	—	—	S
Lettable Guests' Bedrooms	S	—	—	—	—	S

E = *Essential* S = *Sometimes installed*
D = *Desirable* M = *May be required by some tenants*

and, as far as the architect is concerned, unknown tenants. There is a tendency in many cheaper schemes to be too economical in the number of points provided, especially plug points, in order to make a total cost reduction on the whole scheme ; such reductions in services or equipment are not always comparable to the loss of convenience to tenants ; the plugs are wanted for many varying purposes such as reading lamps, clocks, plate warmers, hair-dryers, wireless, etc. Gas or electric points for heating are desirable in all rooms (excepting in working-class schemes) for use with fires ; vacuum cleaning points will also be required in most types when the power available is electricity.

Wiring and tubing for each flat should be accessible within the flat without the necessity of entering another. Meters should also be placed in accessible positions and preferably so that the dials may be read without entering the flats, especially in those flats which may be often unoccupied through the day.

Corridor and staircase lighting should be adequate and controlled with key switches by the porters in high-rental schemes, by time or remote switches in other types.

Bells—These should be installed from entrance doors of individual flats of all types except working class (knockers) and from main entrances of blocks where porters are not constantly on duty. In medium- and high-rental schemes bells with proper indicators are required from all rooms to kitchens.

Refrigeration—There is a growing demand for the installation of refrigerators, and for high- and medium-rental flats they are essential. They are generally installed by the owners but operated by the tenants unless a central plant is used ; the former has generally proved more satisfactory. For medium and the better of the low-rental types, gas or electric refrigerators are often installed if required and a small extra charge is sometimes added to the rental. Plants which are as silent as possible should be selected.

Water Softening—In some districts water softening is a necessity for central hot-water systems and must therefore be provided in all better class schemes. In districts where the necessity to soften water is not very great, installations should only be provided in high-rental types, as the

capital and upkeep costs are not justified in cheaper schemes.

Vacuum Cleaning—Central vacuum cleaning plants are seldom installed for the use of tenants, although in high-rental types, where public halls and corridors are carpeted, a central system is useful to the owners. It is doubtful, however, if a central system is cheaper than ordinary portable plants. Tenants provide their own apparatus and use the ordinary power points in the rooms.

Plumbing Fittings—The baths, basins and sinks provided are often of inadequate size ; the extra cost of the larger sizes is small and the increased convenience and attraction to tenants is fully appreciated. Another important consideration is the provision of large supply pipes for hot and cold water for quick filling of fittings and equally large waste pipes for rapid emptying. The use of one-pipe soil and waste water systems should be extended, or at any rate considered in all large schemes. W.C.'s and their flushing systems should be selected for silence in operation and care should be taken to insulate any noise from important rooms.

Lifts—Lifts are necessary for all high and medium rental schemes regardless of the heights of the building and for all other schemes having more than four storeys. The question of the number of lifts to be installed seldom arises except in corridor type schemes of small flats where one lift per hundred small flats is generally adequate. In high- and medium-class schemes lifts are generally operated by porters and in other schemes push-button types are usual.

When push-button lifts are installed it is wise to use self-closing gates to overcome the omission by users to close the gates after leaving the car. It is wise also to fit automatic alarm signals to tenant-operated lifts to indicate breakdowns in service by ringing at the caretaker's office. Goods lifts are generally necessary in all but working-class schemes and even low-rental types need lifts capable of carrying large pieces of furniture up to the size of large settees and pianos ; hand-lifts should be designed for a load of at least one hundredweight. The isolation of lift noises by adequate insulation of shafts, doors and motors should be given very special attention.

Radio—A number of blocks of flats in this country have so far been equipped with a central radio or radio-diffusion installation. There is still some doubt whether the cost of installation and upkeep added to the possibility of dissatisfaction with the service is worth the expenditure, a part of which is concerned with almost constant supervision. It is probable, however, as such systems are perfected they will become standard equipment. The alternative is for each tenant to own, install and operate his own apparatus. Attention should be paid to a publication on this subject by the R.I.B.A.

Telephones—There are three types of telephone installation to be considered. Firstly, intercommunication between rooms in each flat which is seldom installed except in very high rental schemes. Secondly, for communication to the porter's box at the main entrance and to the tradesmen's entrances, both of which are desirable for all high- and medium-rental schemes ; particularly so that tradesmen calling for orders are not forced to climb many flights of stairs. The third system is the ordinary Post Office telephone, for which provision should be made in all but the lowest rental schemes at the time of construction to avoid wiring at later dates, especially externally. The group telephone system announced by the Postmaster-General before the last war will make for increased service in flats, especially for the lower rental types.

Carpets—All better class flats should have the staircases, entrance halls and corridors covered with carpet for appearance, warmth and quietness.

Built-in Fitments—Built-in fitments (excepting bedroom cupboards and kitchen cabinets or dressers) are seldom provided except possibly in special flats which are let on a semi-furnished basis. The majority of tenants do not yet seem to like built-in furniture nor do owners feel inclined to install it with the increased rental charges involved unless they are moderately certain that tenants require such fitments. Even bedroom cupboards are often not wanted, as tenants have suites of furniture including wardrobes for which the rooms have insufficient space if the cupboards remain and they prefer to retain the wardrobes in case they require them at the end of their tenancy. Bookshelves in living-rooms are sometimes provided. In medium and high-class flats, tenants appreciate built-in bathroom fitments such as soap-dishes, bath grab-rails, toilet-paper holders, a medicine cabinet, mirrors with glass or composition shelves, glass holders, etc.

Wall Safes—Small built-in wall safes are appreciated by tenants in high- and medium-rental types for storage of jewellery and important papers.

Locks—It is a great convenience to tenants to have all external door locks, such as the entrance doors to the block, individual flat entrance doors and garage doors controlled by one master key to save carrying several keys. The head porter or owner should have a master key opening all individual flat entrance doors for emergency purposes.

Postal Chutes—So far chutes have not yet been extensively installed although they are inexpensive conveniences in high-rental schemes.

4. *Small Flats*

TABLE SHOWING THE MORE USUAL COMBINATIONS OF UNITS IN THE VARIOUS TYPES OF FLATS REFERRED TO IN THE SECTION										
Type (The letters refer to Figure 1)	Living-Room	Folding Bed	Bed Recess	Bedroom Separate	Kitchen Recess	Kitchen Separate	Bath	Bath and W.C. Combined	W.C. Separate	Combined Kitchen and Bath
1	*	*						*		
2	*	*							*	*
3	*		*						*	*
4 (Type C) ...	*			*					*	*
5 (Type A) ...	*	*			*			*		
6	*	*				*		*		
7 (Type B) ...	*		*		*			*		
8	*		*			*		*		
9	*		*	*				*		
10 (Types D & E)	*			*		*		*		
11	*			*		*	*		*	

Introduction—There has been a great increase in the demand for very small flats in recent years; this demand is not confined to any particular section of the community or to any special section of rental prices. Small flats are required equally by comparatively low-paid persons and by the richer elements of the community including childless couples, single persons both young and old. The main differences between the flats provided for different classes are site position, size of rooms and, above all, the amount and quality of equipment.

The Plan Units—The chief units of small flat plans are the living-room, sleeping accommodation (either as part of the living-room or as a separate unit), cooking facilities, toilet facilities. The Table shows the more usual combinations of these units as various types, and should be read in conjunction with Figure 1, which illustrates some typical plan arrangements of the different types.

Type 1 (see Table) provides only a living-room; this is also used for sleeping by means of a folding bed and a combined bath-room and W.C. Cooking is a communal service provided by means of a restaurant on a lower floor. This type is closely allied to an hotel or club, but permits of a more personal interest being taken in an individual set of rooms; it is also especially suited to single men and women who are away during the day-time at work and, therefore, do not wish to cook for themselves.

Type 2 is somewhat similar to Type 1, but it has a combined kitchen and bathroom and a separate W.C.; in some cases the W.C. has been placed on a balcony to which two flats have access, and one W.C. is therefore shared by the two flats.

Types 3 and 4 are similar to Type 2, but in the case of Type 3 there is a bed recess instead of the folding bed, and in Type 4 there is a separate bedroom. Types 2 and 3 are suitable for single persons who are at home for only small parts of the day, but Type 4 is satisfactory for a married couple due to the separation of the living-room and bedroom.

Types 5 and 6 both have living-rooms with folding beds and a combined bathroom and W.C., but in the one case there is a kitchen recess and in the other a separate kitchen; the latter is undoubtedly a better type and commands higher rentals.

An extension of these types is the formation of a dressing recess in which the folding bed is placed in the daytime and also serves as a large wardrobe and dressing space; this system has been widely used for very many years in America, where the small flat has been so extensively developed.

Types 7 and 8 are similar to Types 5 and 6, but have bed recesses instead of folding beds; if the folding beds are properly arranged—especially with a dressing space type of lay-out—they are preferable in many ways to the bed recess types.

Types 9, 10 and 11 are more elaborate and are those usually applied to

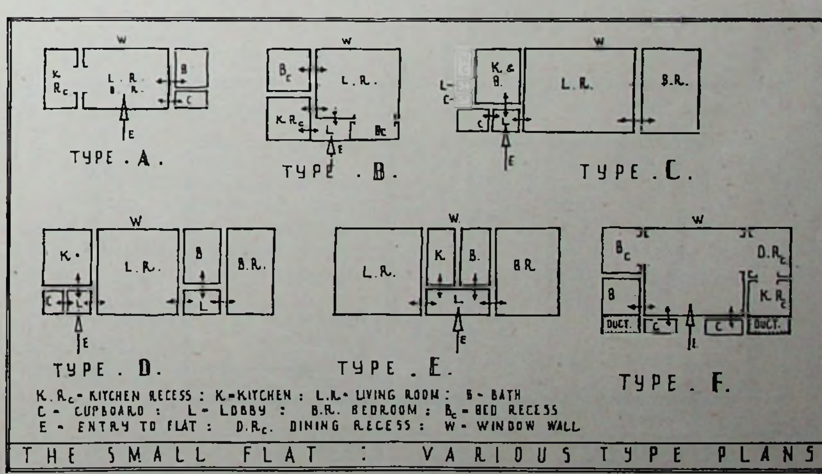


Figure 1

small flats where the district and surroundings permit of higher-grade rentals; especially is this so in the case of Type 11, which may, by the provision of rooms of large floor areas and elaborate equipment, form the highest class type of small high-rental flats, especially if service is provided in addition. In this flat the living-room, bedroom, kitchen, bathroom and W.C. are all separate.

The various plan types shown on Figure 1 illustrate a number of those discussed above, but also show in greater detail the relation of the rooms to one another, lobbies, entrances, external walls, etc. Type A corresponds with Type 5 on the table; the entrance is directly into the living-room and external walls may or may not be provided to light the recess for the kitchen in addition to that required for the bathroom. The kitchen recess may only be deep enough to receive a sink or cooking stove and be divided from the main room by a curtain.

Type B corresponds with Type 7 of the table; it is to a large extent a variant of Type A, but has more space and the added advantage and comfort of an entrance lobby and the full separation of the cooking unit.

Type C corresponds with Type 4 of the table; the full-size and separate bedroom here appearing on the diagrams for the first time. It will be noted that the W.C. must be cut off from the kitchen (a "habitable room") by a ventilated lobby.

Types D and E provide similar accommodation but in different ways, each having some special points in its favour. Type E has the plumbing and drainage services grouped together owing to the bathroom and kitchen adjoining each other, but one common lobby has to be shared by the entrance and internal circulations, whereas in Type D an entrance lobby, which is also used as a cut-off between the kitchen and living-room and another lobby, used to separate the bedroom and bathroom from the living-room. Type D is, therefore, more suitable for flats where higher rentals may be charged.

Type F is one of the most common lay-outs used in American small flat planning, and is dependent on the fact that artificial ventilation may be used for the kitchen and combined bathroom and W.C. In some areas in this country this ventilation system is now permitted and on analysis it will be found that considerable saving in planning may be made on many sites as the length of external wall required for each flat may be reduced, although the span has to be increased. The basic idea of the planning consists of a living-room which is also used for sleeping by means of folding beds either as divans in the daytime or moved away into bed recesses when not in use; the bed recess also serves as a combined wardrobe and dressing-room. The bathroom and the kitchen are placed on internal walls, which ensures that steam and odours of cooking are drawn away by the mechanical extraction plant near their source and clean air enters these rooms from the living-room; the reverse is apt to happen when windows are used for ventilation.

The space corresponding to the bed recess between the kitchen and the outer wall is used as a small dining-room usually divided from the kitchen by low fixtures, such as china cupboards.

This lay-out also shows cupboards so placed as to form a sound screen between the corridor and the living-room, and in addition permits two doors at the entrance to the living-room, thus forming a small lobby.

Figure 2 illustrates a type of small flat which does not seem to have been developed in this country. It consists of one large room occupying approximately the normal equivalent of two floors in height, with part of the area of the flat covered by a mezzanine floor. Type A has a large living-room or studio, with a gallery for sleeping purposes placed against the corridor wall. The kitchenette is placed to one side, with the bathroom and W.C. over it; this arrangement of rooms does not require artificial ventilation, as all rooms have windows; the plumbing also is well grouped together for economy. If the approach corridor is eliminated at the mezzanine level, where it is not necessary, the depth of each gallery may be increased by half the width of the corridor.

Type B depends on artificial ventilation for the bathroom, and is therefore only applicable in districts where this system is permitted. The advantage of this type is the possibility of having a separate bedroom if desired, as it can have a window at the upper level.

The kitchenette may also be attached to the ventilating system serving the bathroom, in order to remove cooking smells, which may otherwise penetrate to the main room. The primary use of these types is as studios, but they have been very popular for ordinary living purposes in other countries, especially in America.

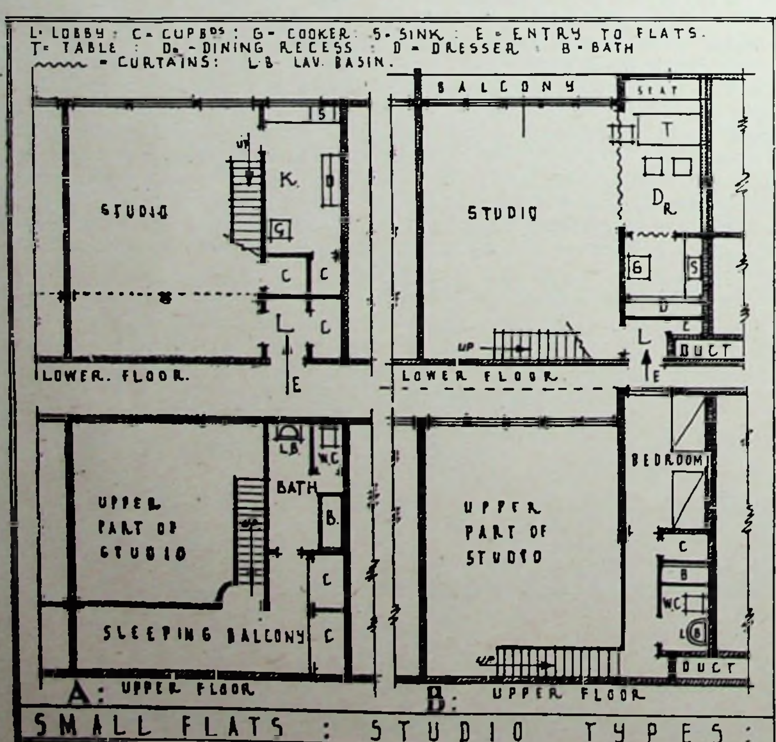


Figure 2

Sites—In many instances the sites chosen for small flats, especially in the high rental groups, are small and rather confined in area, being situated in districts where land values are very high, therefore they do not permit ideal arrangement, especially in regard to aspect of rooms. Sites fronting on to busy streets, particularly those carrying much night traffic, should be avoided if possible for very small types of flats, as it is often impossible to plan the living-rooms, which also serve as bedrooms, in quiet positions; this is detrimental to their letting value. However, in less crowded districts, where sites are less costly, consideration should be given to the aspect; large blocks should be placed with their main axis orientated north and south, if the flats are planned on a central corridor system, so that all flats may have sunshine during part of the day; if the axis is placed east and west the sun is excluded from those flats facing towards the north.

The relative merits of each aspect may be compared in Figure 3, Diagrams A and B. All the flats in Diagram A have sun for part of the day, and the sunless north aspect need not have any windows except for staircases.

Diagrams C and D in Figure 3 show how the difficulties of aspect may be treated in courtyard type plans. Diagram C shows the better lay-out, larger flats being planned on the east and west axis so that the one-room flats are in positions which obtain sun at some time during the day. The dark corners may be used for staircases and larger flats; the larger flats having north and south aspects, have sun in some rooms, and also have the through ventilation which is desirable for flats of more than one room. Diagram D shows a scheme entirely of one-room flats, in which the few which have north aspects only are lettable for studio purposes.

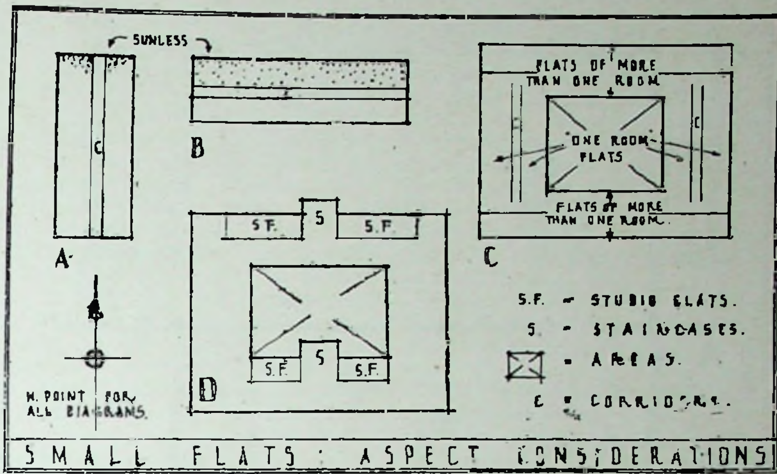


Figure 3

General Block Plan—Small flats may be planned on one of two systems of circulation, either approached directly from small staircase halls or from corridors with few staircases; the latter system is probably the most economical, as the cost of additional staircases and especially of lifts, if the latter are required, more than offsets the cost of the increase in the cubic content of the building involved by the use of corridors.

Balcony approaches are not very desirable for small flat schemes, unless the block is only the span of one flat, which is probably an uneconomical lay-out. The objection to balcony approaches in such flats is the necessity of passing by living-room windows and the overshadowing of the only windows to the flats by the balconies of the floor level above.

A further objection to balcony type flats is that the flats are placed back to back and the advantages of the sound insulation qualities of the corridors are lost. Balcony approaches are, on the whole, rather dismal and dreary and quite unsuitable for small flats and for better class tenants and if used on each side of a block are apt to be costly, owing to the duplication. A further objection to the back to back scheme is the inability to obtain through ventilation, which is to some extent available by means of the corridor system.

The general analysis of site planning for flats, together with general circulation, is discussed in the Section on "Flats" where a considerable amount of the information given is equally applicable to the planning of small flats.

Corridors—In schemes where corridor circulation is adopted staircases should be placed so that escape from the entrance door to any flat may be in one of two directions; this generally seems to work out most satisfactorily when staircases are placed at each end of the corridors, or, in the case of a block planned round a courtyard, either at the corners, or, better still, at the centre of two opposite sides on the sunless aspect; in some districts regulations may require that no entrance door to an individual flat is more than 80 ft from a staircase, but sometimes dual methods of escape are not required where the total number of occupants of the block is small and the height of the building does not exceed about four stories.

Corridors should not be less than 3 ft 6 in wide, even when one or two flats are to be served, but in all other cases 4 ft should be considered to be the minimum; if the corridors are long and many flats are approached from them, then much greater width is desirable. In all types corridors should have finishings to reduce noise to a minimum and in all higher rental types carpets are essential. Similar provisions should be made for the lifts, especially as regards silent operating when they adjoin flats.

Service Facilities—Separate service entrances are seldom provided to small flats themselves, but in those blocks in which the flats command high rentals, service staircases and lifts should be provided, so that tradesmen and deliveries do not have to use the ordinary passenger lifts and the carpeted staircases, although they have to use the same corridors as the tenants and their visitors. When service staircases are provided, separate service entrances to the blocks should be planned.

If food is to be served in individual flats from a central kitchen, service lifts should deliver, if possible, into small service rooms on each floor; also, in higher rental types, if space will allow, an entrance from the corridor directly into the kitchenettes of each flat should be provided, so that the kitchenette becomes a service pantry.

Porters' Rooms—Most schemes of small flats require a porter's room adjoining the entrance to the building, or, in large schemes, near the main approach. Flats of this nature are left unattended for the greater part of the day and it is therefore a convenience to tenants if parcels and messages may be left in charge of a porter or resident caretaker: also someone has to take charge and supervise the cleaning of staircases, upkeep of gardens, etc., this may all be undertaken by one and the same person. The porter's room should be fitted up with a number of shelves or large pigeon holes numbered to correspond with the flats. In high-rental schemes the porters carry out similar duties to those required of them in large flats, but in lower rental schemes their duties are more those of caretakers. Night porters are only needed for high-rental flats. Elsewhere it is advisable for the porters or caretakers to have living accommodation as part of the scheme, so that they may perform such duties as controlling outside doors, landing and staircase lights and other similar jobs.

Sub-rentals—On many sites the flats only yield part of the total rental income of a scheme, as in schemes of large flats, the street level floor may be useful for shops. This is discussed in the section on "Flats". In schemes of small flats there are openings for special shopkeepers dealing in goods such as cooked food, hair-dressing, tobacco, stationery, or running small restaurants. These shops may be leased out separately, or may be run by the proprietary company, especially in the case of restaurants; it is doubtful, however, whether, except where very large flat schemes are concerned, the trade produced by the tenants of the flats alone will be sufficient to produce a satisfactory turnover, unless other trade can be counted upon. In medium and higher rental types of small flats a few rooms may be required for the personal servants of tenants, together with a sitting-room and in some cases a dining-room; when provided such bedrooms should be divided into two groups for men and women respectively and should be large enough to be used as bed-sitting-rooms.

When flat schemes are outside the central area of towns and sufficient land is available, garage facilities

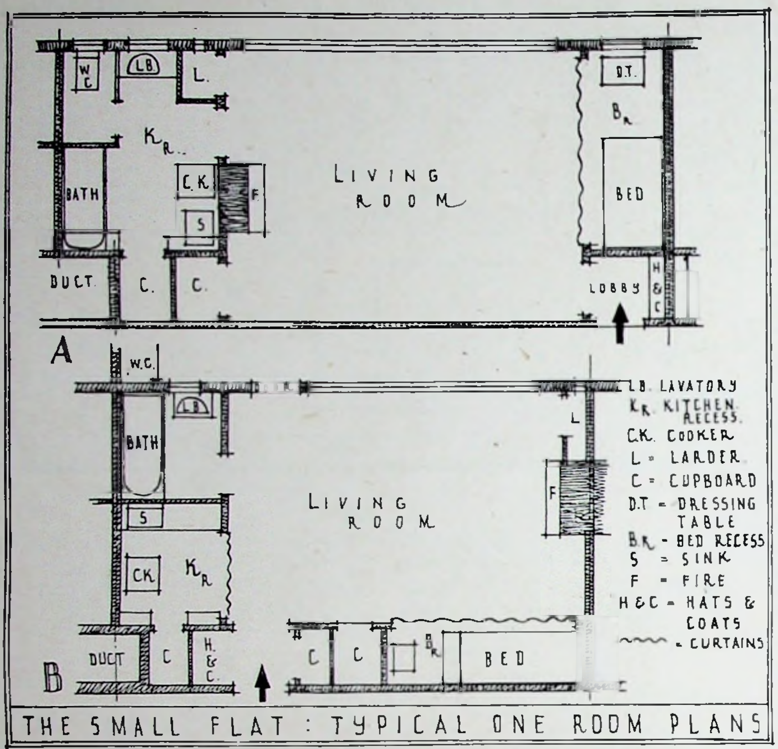


Figure 4

should be provided, the amount of accommodation being in the main proportionate to the rentals of the flats. A great attraction to tenants of the small flat and one which provides additional revenue, is the installation of swimming baths, squash rackets courts and tennis courts.

Room Sizes—It is impossible to lay down specific sizes for the rooms required in these types of flat, as the dimensions are to a very great extent dependent on the anticipated rental value, which again is largely governed by the placing of the site. Flats commanding higher rentals due to their locality generally require larger rooms. Owing, however, to the high value of the site this increase cannot always be given. Another factor is that tenants occupying the high-rental type need a greater amount of furniture, either fixed or movable, together with extra equipment, which again necessitates more room.

Plan Details—The efficiency of the small flat plan depends almost entirely on the economy of space which can be obtained by elaborating fitments and the complete designing of all details, based on the minimum space required for each operation or piece of equipment.

Living-room.—The living-room in the smallest types has to serve also as the bedroom and kitchen, and must therefore be so planned that when used for each separate purpose the elements concerned in the other purposes are as unobtrusive as possible. They must at the same time be well placed in relation to windows, doors, artificial lighting and heating. The entrance to the room from the corridor should be screened from the room, if possible, as shown in Figure 4, Diagram A, or have double doors as in Diagram B ; the former lay-out is better, as the latter is apt to be somewhat cramped. The entrance lobby formed by the double doors helps to reduce corridor noise. The bed may be a divan which is used as a settee in the daytime, placed in the room as a piece of loose furniture, or it may be an ordinary bed placed in or built into a recess as shown in both diagrams. When recesses are used they should be placed behind the entrance door and shielded from it to avoid draughts between windows and doors. In many instances the bed recess is divided from the main room by a curtain thus leaving a rectangular room for daytime use. The heating of the room is an important consideration. A fire of some sort is generally needed with the addition, in most types, of central heating, the radiators for which are placed under the windows. As the flats are generally not in use all day, except occasionally at week-ends, gas or electric fires are usually installed ; this means less work for the tenants and does away with the necessity of providing fuel storage space.

Two of the smallest types of one-room flat are illustrated in Figure 4. Type B has the fault that the W.C. is not placed within the flat, but on a balcony with external approach. This system has been extended so that two flats share one W.C. placed on a balcony approached from both, an economy which does not seem desirable. A smaller type than that shown in Diagram B may be designed by combining the bathroom and kitchen and by separating the combined room from the living-room by a door, the W.C. again being placed on a balcony.

A difficult problem frequently arises in regard to the placing of the larder which has to be externally ventilated. The diagrams illustrate two different positions, but in both there is the likelihood of the external wall having a westerly and therefore hot aspect. Windows are not generally used for larders of this type, the ventilation being provided by two airbricks. The larder of this type of flat may be very small and is only in the nature of a fair-sized cupboard, which generally acts for other storage purposes as well.

On congested sites the long dimension of the living-room may have to be turned the other way to that shown in the Figure. Such a lay-out is not an advantage from the tenant's viewpoint, as the back part of the room is less well lit by the window.

The lay-out adopted in Type A for the kitchen and bathroom provides a combined room, which forms a ventilated lobby between the W.C. and living-room. Also, if a flap top is provided over the bath a useful table is added in the kitchen which cannot be provided in a congested recess as in Type B. Two further good points in Type A are, firstly, that the kitchen has better light than can be obtained in a recess shielded from windows as in Type B and, secondly, that this type permits of a greater amount of wall space against which furniture may be placed.

In both examples the bed recesses have been made large enough to take a dressing-table in addition to the bed. This eliminates the necessity of putting away those things usually standing on it, which is desirable if the dressing-table has to be in the living-room itself. In Type A it is possible also to provide a window by the dressing-table, which incidentally ventilates the bed recess when the curtains are closed in the daytime. The minimum size of the living-room itself should be based on a sufficient allowance for at least the following furniture : a small table for meals, two small chairs, one armchair and a writing-desk. Rather more furniture may be necessary, especially in higher rental types, where additional space is needed for clothes storage, wireless cabinets, pianos, sideboards and other articles.

Artificial lighting points in the living-room should be provided for a central light, for reading lamps at the desk and fireside and for a bed-head light.

In each example ducts have been indicated for service pipes and plumbing, but no doubt in many examples these might not be used. There is, however, an important point in favour of this provision when one considers how easily the passage of sound from one flat to another is aided by means of water-service pipes.

Kitchen—The cooking requirements of the very small flat are generally small and vary considerably, according to rental value. In most types the accommodation may be planned either as a simple recess in the living-room, or it may be in a small separate apartment. As not more than two persons are usually resident in these flats and such occupants frequently have meals away from home, only a very small floor area is necessary, but it must be provided with compactly planned and efficiently fitted equipment. The items of this equipment need not be numerous, nor need they be other than of minimum size. The essential components consist of a small cooker, a sink and draining-board, with a plate rack over and/or cupboard under, a general storage cupboard for brooms, utensils and dry goods and a larder or refrigerator. In some districts, if a refrigerator is provided a larder is not necessary. But the bylaws in most areas require the provision of a properly ventilated food storage place, which is a factor frequently complicating the planning of the whole flat and one, therefore, which should receive early consideration.

Figure 5 illustrates two types of kitchenette which are merely recesses in the main living-room and separated from them by a curtain. Type A occupies only about half the side of the room, whereas the other type is larger and occupies practically the whole wall. The great difficulty experienced with this type of kitchenette is to eliminate entirely or evacuate quickly and efficiently the smell of cooking, which can only be achieved by mechanical extract ventilation near the fittings. Even such a provision is not very satisfactory, as mechanical ventilation is frequently too costly to install in schemes for which the range of rentals available permits only of flats having this type of kitchen recess. In Type A a combined pipe duct taking wastes and service pipes is indicated with a false ceiling over each recess in which the pipes of the floor above cross from the fittings to the ducts. Type B has a wide but narrow pipe duct which is more suitable when the one-pipe system of plumbing is not used, as the fittings in two kitchenettes are placed back to back, with the pipes immediately behind them. These kitchenette recesses should be at least 3 ft deep in order to give the fittings plenty of room and also to protect the flooring material of the living-room from damage by splashing of water and grease. The recess itself is most suitably floored with tiles or a similar hard material. The minimum width for a recess should be about 7 ft 6 in.

In the larger types of these flats rather more equipment than the barest minimum as suggested above is usually provided. This additional equipment generally consists of more storage space, so that brooms and utensils are kept separate from china, glass and dry goods, a kitchen cabinet fitting including a working table surface or sometimes a folding table and a folding ironing-board. Cooking is generally by means of gas or electricity, and hot water is from central sources, although the latter is sometimes not provided in the lowest rental types. In this case local gas or electric hot-water heaters are necessary. Facilities for home laundry, other than for ironing, are not often provided. The few articles which are likely to be washed at home by a woman tenant do not justify the installation of a copper or washing machine.

Figure 6 shows two kitchens of larger size than Figure 5, and which are more thoroughly cut-off from the living-room than in the case with the simple recess types. Both of the types shown could, if desired, be shut off from the living-room by a door, although this would reduce somewhat the amount of light available from the living-room windows through the large opening between the rooms.

Type A is based on a type plan used very extensively throughout America, and for really good working depends on artificial ventilation. There is a further drawback in the fact that artificial light is necessary for the greater part of the year in the kitchen section of the room shown. This type

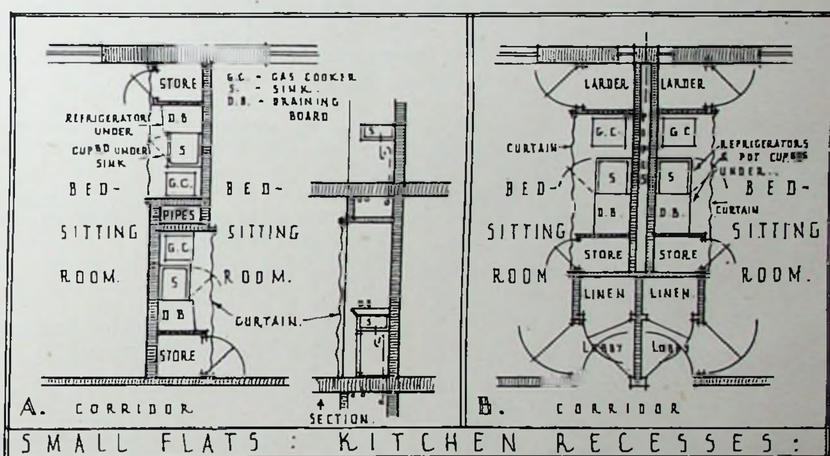


Figure 5

combines the dining recess with the kitchen; separation between the two is by means of low fitments for china. An additional difficulty with this type of plan is the placing of the larder, if it is required by the local authority, a matter which does not arise in America where refrigerators are universally used for food storage, owing to the climate. A special feature of this plan is a patent delivery hatch accessible from the corridor, in which tradesmen may make deliveries in the absence of the tenants of the flats. This fitting has a series of small compartments, the doors to which are locked automatically after the delivery is made and are then emptied from the flat side on the tenant's return. The meters are placed in a compartment under this fitting, so that they are also accessible to the supply companies' inspectors, thus avoiding the necessity of obtaining admission to the interior of the flats. This is a point

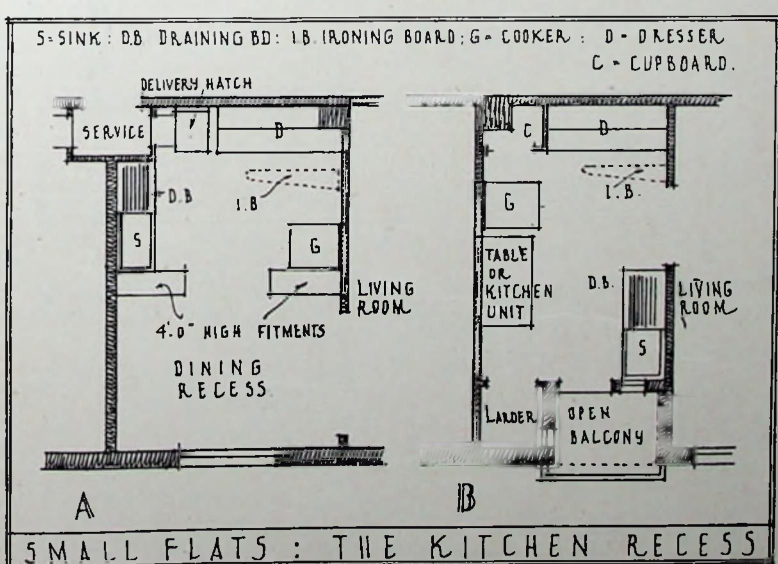
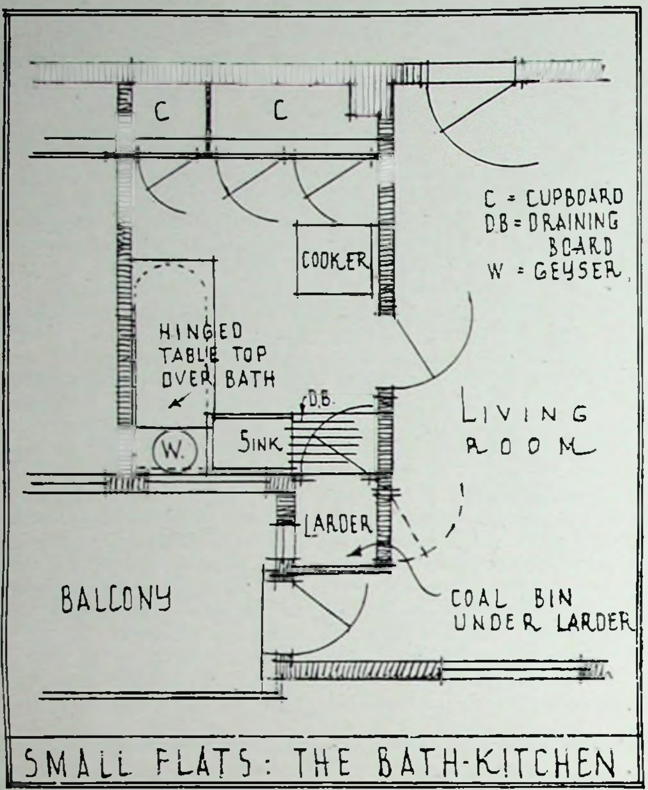


Figure 6

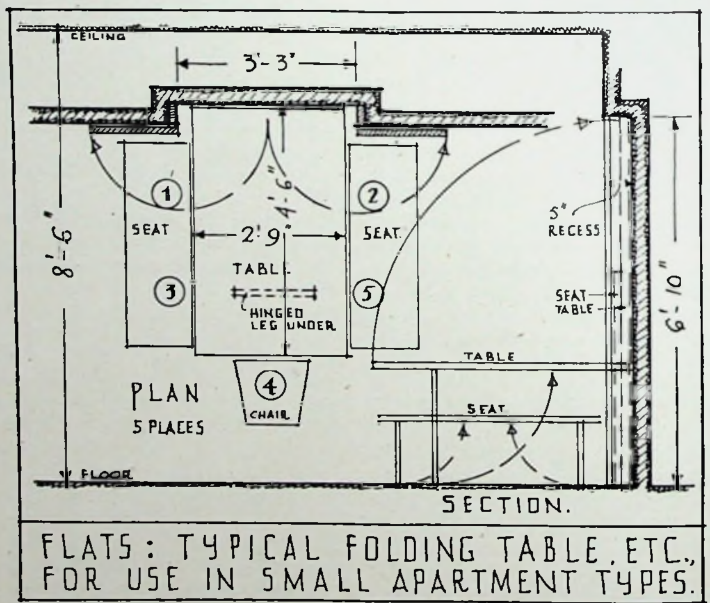


SMALL FLATS: THE BATH-KITCHEN

Figure 7

which should be given consideration in all flats which are likely to be left unoccupied during the daytime. Type B in Figure 6 shows a kitchen more suitable to general conditions in this country. The dining recess is omitted and the full depth of the room is devoted to the kitchen itself, although the width of the room is considerably reduced, in fact to a width of about 6 ft. This type permits of the provision of a proper larder and an open balcony on which a dustbin and small clothes line may be placed. This plan gives a floor area which permits of a well-arranged lay-out of fittings and equipment without unnecessary cramping or building of one fitment over another.

Figure 7 illustrates a kitchen plan in which is incorporated the bath, a type which is only suitable for lower rental flats mainly occupied by single persons. This plan permits of several economies to be made, such as reductions of area and the convenience of plumbing services for the bath and sink, but necessitates the omission of the lavatory basin, which is probably an undesirable economy. The larder, although more convenient if accessible from the kitchen, is probably more hygienic if approached from the living-room, so as to be cut-off from the steam and heat of the kitchen. A hinged table-top is placed over the bath for use during the preparation of meals, as the room does not permit of space being devoted to a table, although one might be incorporated in a kitchen fitment placed where the larger cupboard is indicated. Provision for coal storage, if needed, is made in the lower part of the larder space. This is often in the form of a movable bin with a separate access door.



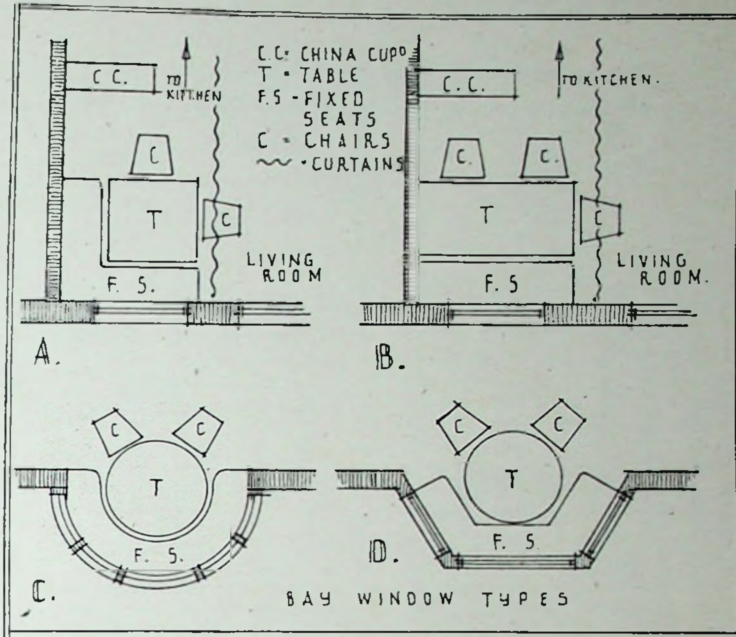
FLATS: TYPICAL FOLDING TABLE, ETC., FOR USE IN SMALL APARTMENT TYPES.

Figure 8

Dining Recess—In many of these small flats meals have to take place in the only living-room. In this case it may be necessary to use the same table as is used for other purposes, but in some instances a folding table, as illustrated in Figure 8, may be installed. This fitment consists of a table about 4 ft 6 in long by 2 ft 9 in wide, which is fixed in a recess and folds down into the room from behind a pair of doors. In addition to the table two bench-seats may be included in the fitment. Alternatively a corner of the room may be set aside for dining purposes with a movable table, as shown in Figure 9, Diagram A, which has a fixed seat against one or two walls for general use and loose chairs on the other sides for occasional use by visitors. This part of the room may be separated from the remainder of the room by a curtain, except during meals. Figure 9 shows a similar arrangement of the room but with a fixed table and a fixed seat on one side, with movable chairs for visitors' use on the other side and at the end of the table. Bay windows in living-rooms may also be used as dining recesses, as shown in Figure 9, Diagrams C and D. Such lay-outs save a considerable amount of floor space in the living-rooms themselves, as a fixed window seat constitutes the normal furniture and the table may be pushed into the recess after meals, thus occupying very little space in the main room. It is, however, practically impossible to curtain off these bay windows from the room owing to the loss of light which would result. Other types and diagrams of dining recesses, which should be referred to, are illustrated in the Section on "Flats."

Bed Recesses—The bed-sitting-room type of flat exists in nearly all classes, but more specially in the low and medium types for special purposes, such as the housing of business women and students and they become much on the same lines as hostels, except that each apartment is self-contained. Figures 10 and 11 show various arrangements and types of beds for

bed-sitting-rooms. One of the most difficult problems in this type of flat is the provision of adequate ventilation for sleeping when a bed recess is used, as one of the most convenient positions for it is generally found to be against the internal corridor wall, thus reducing the frontage occupied by each unit. If, however, the recess can be placed on an outside wall, a window can be given to it. It will be noticed that the areas required for bed recesses are considerably less than is needed for a separate bedroom and are, therefore, more economical to build, with consequent reductions in rentals. Figure 10 illustrates four types of bed recesses for small flats. Diagrams A and C provide for a double bed, while B and D are for single ones. It should be noted that double beds require circulation space on both sides, and, therefore, there is no difference in the amount of floor space required, whichever way the bed is placed ; but if a single bed is placed as in Diagram D, the floor area required is much less than when the bed is placed as in Diagram B. The bed-sitting-room type of flat has reached a high standard of planning in the large cities of America, especially in regard to the design and planning of equipment for ease of working and economy of space. The bed recess is little used in America, preference being given to the numerous types of folding and portable bed such as are illustrated in Figure 11, all of which occupy little floor area during the day and are brought into the room at night. Type A illustrates a tip-up type requiring the minimum floor area ; as shown by the section, the head and foot of the bed fold over and grip the bedding when the bed is tipped up into the recess, which is covered by doors in daytime.



THE SMALL FLAT : THE DINING RECESS.

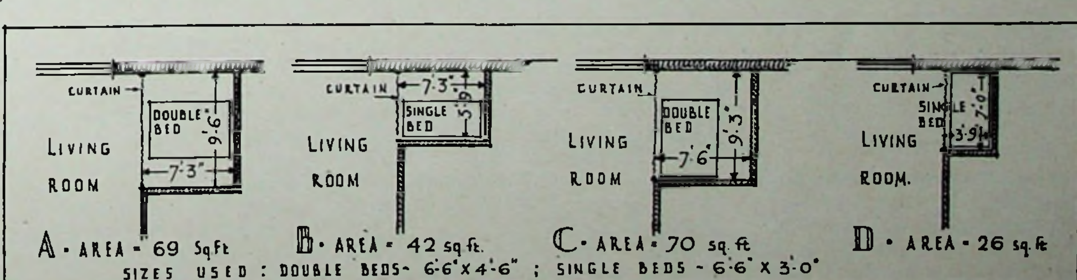
Figure 9

Type B is used very extensively in America. The bed tips up as in type A, but is attached to the cupboard door, which remains closed when the bed is put away and also when it is in use. It is generally used in conjunction with a dressing-room or a cupboard fitting, to which access is obtained through one of the side doors of the bed door fitting.

Type C has been used considerably in mid-Europe, and does away with the chance that the bedding may slip when the bed is tipped up, as the beds fold away horizontally under a built-in fitting which forms a seat in daytime with bookshelves or cupboards above it. Other types which are not illustrated are those which become settees or day-beds in daytime, thus being more or less part of the living-room furnishings. In another type the bed folds up vertically and is pushed away on special wheels into a cupboard in the daytime, the great advantage of which is that the bed may be placed anywhere in the room for sleeping, whereas the types illustrated have fixed positions.

Fitted Furniture—There has been a very great increase in the use of fitted or built-in furniture in recent years, especially for small flats, and this is undoubtedly one of the most important economies in space saving which can be made. It is, however, doubtful whether built-in furniture appeals greatly to landlords owing to their responsibilities for wear and tear, and to the fact that tenants take less interest in the care of landlords' fixtures than they would of their own property. Also there are still a large number of prospective tenants who own furniture which they wish to use and which cannot be put into the rooms in addition to the built-in furniture. However, there seem to be a number of tenants who are prepared to rent semi-furnished flats and who are willing to pay an increase over the non-furnished flat rental. This makes a handsome return on the money invested in furniture and fitments, after allowing for ample depreciation. Built-in fitments and furniture should be simple in design, well made and solidly constructed, in order, in the first place, to be usable with other furniture the tenants may bring with them, and secondly, to reduce wear and tear as much as possible. Cheap and poorly made fitments although economical in first cost cause annoyance and discontent among tenants and are in the long run very costly. The fitments should be carefully designed for their individual purposes and should be sufficiently large but not so large so as to reduce unnecessarily the floor space.

Balconies—In urban and semi-urban schemes private balconies other than those which may be needed for W.C.'s as previously suggested, or for access to flats, are attractive features.



FLATS : MINIMUM SIZES OF BED RECESSES IN "ONE ROOM" TYPES

Figure 10

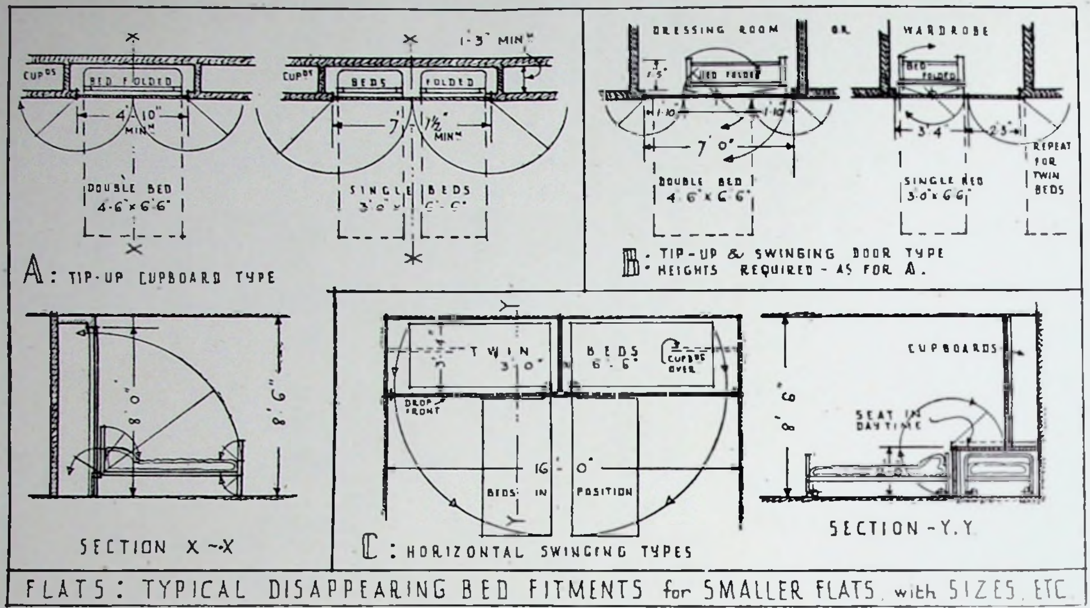


Figure 11

They should be separate from any balconies used as approaches to the flats and are preferable if reached from living-rooms and bedrooms by means of French windows. Although a small balcony attached to the kitchens is useful for storage of dust-bins, fuel bins, etc., it is apt to cause untidiness.

Communal and Service Rooms—There are certain rooms which must be provided in all schemes of small flats, such as cleaners' rooms, but in addition consideration may be given to the possibility of the installation of rooms for the joint use by tenants such as laundries, lounges and restaurants. Laundries have not proved very popular in this country although this does not seem to have been the case abroad. Lounges do not seem very necessary or likely to be greatly used, although when the flats are very small some tenants may feel that they prefer to meet visitors in a room of more ample dimensions than their own sitting-rooms, especially if the lounge is attached to a restaurant. Restaurants do not seem to have proved profitable to the operators (except in blocks of high-rental flats), unless they can depend on a reasonable amount of trade from outside the building or unless the building itself is very large and consequently has a large population of its own. Tenants of the lower rental types appear to prefer flats with cooking facilities rather than those mainly dependent on a communal restaurant.

Service Flats—The notes given in these articles apply in general to service flats as far as accommodation in the individual flats is concerned, while the kitchens are similar to those for hotels and restaurants. The food in some is consumed in a restaurant or common dining-room, but more generally in the individual flats. In this case the flat kitchen may be eliminated altogether or used as a service pantry either by direct lift communication with the kitchen, or by a door leading to a corridor in which is a service room communicating with the kitchen.

In the past central kitchens for service flats have been placed on the topmost floors, but with efficient lifts and good basement ventilation to eliminate smells, the top floor is of much greater value for residential purpose ; while the basement, which is useless for flats, may well be occupied by the kitchen and its services.

TYPE OF EQUIPMENT	RENTALS Low	Medm	High
Central Heating	S	D	E
Open Fire	—	S	D
Gas or Electric Fires ...	E	E	E
Constant Hot Water ...	D	E	E
Hot Towel Rail (Bath) ...	S	D	E
Refrigerator	S	D	E
Telephone, Post Office ...	—	S	D
Telephone, House... ...	—	—	D
Bells at Entrance ...	S	D	E
Wireless, Central Installation	—	S	S
Stores : Basement or apart from flat	S	D	E
Stairs, etc., soft floor covering	—	D	E
Bookshelves, built in ...	S	D	E
Bedroom cupboards ...	E	E	E
Kitchen dresser	E	E	E
Ironing Board	D	D	—
Delivery Hatch	D	D	D

S = Sometimes required
D = Desirable
E = Essential

Equipment—The equipment of small flats, as regards all mechanical services, should, in general, be more complete than would be provided for larger flats of equivalent rentals. The accompanying table is a general indication of the equipment usually provided in such flats according to the anticipated type of tenant and the precise rental obtainable for the accommodation in relation to the situation of the site.

Central heating is advantageous to all types, as it eliminates, to a large extent, the use of other methods of heating, except in very cold weather, and always provides a warm building. This is appreciated particularly when the flats are unoccupied through the greater part of the day, as so often occurs in very small flats.

Provision for heating other than by radiators must be provided by some form of gas or electric fire, whichever is the more economical in the individual scheme. Gas or electricity is generally more popular with tenants of small flats, but in high-rental types coal-burning fires may be demanded by tenants.

Refrigeration is a normal provision in higher rental types and is appreciated by tenants in medium types. In some medium rental schemes a refrigerator is leased at an extra rental to those tenants willing to pay the increased rent.

Most schemes should make provision for post office telephones. A public call-box in the hall under the care of the porter may be adequate for the lower rental types, but indvidual instruments will probably be needed in all higher rental flats.

5. *Schools*

Introduction—The Education Act 1944 has led to very great changes in education which in turn react on the planning of school buildings. The Act provides for building regulations (under Section 10) prescribing standards for school premises, confirmed and issued in March, 1945 (H.M.S.O., price 6d.). These regulations are amplified by a Ministry of Education memorandum (H.M.S.O., price 6d.) and the Ministry of Education circular No. 10 (H.M.S.O., price 1d.). For some years there have been no definite regulations controlling school buildings, but from time to time guidance was issued by the Board of Education in the form of memoranda and recommendations. Normally building by-laws will not be applicable, as the 1944 Act exempts school buildings approved by the Minister from the application of the Public Health Act 1936, but it will be necessary for all school buildings to comply with the requirements of the building regulations issued under the 1944 Act.

The Education Act 1944 provides for changes in future education, and these changes are emphasized by the building regulations and the explanatory memorandum. Generally the compulsory school age is to be raised from 15 years to 16 years in the near future, and ultimately it is to be followed by compulsory part-time continued education for all young persons (under 18 years). New types of schools will be required for the raised full-time age, and " County Colleges " are to be developed for continuation education for the age-groups from 16 to 18 years. The sizes of classes are to be reduced progressively from 50 to 40 children in primary schools, and from 40 to 30 children in secondary schools.

Classification of Schools—The Act and the regulations made under it provide for the requirements of all schools, whether administered by local education authorities or aided in some manner by local authorities. The terms used in the Act to differentiate between the two types of control are " County Schools " for all those administered by the local authorities, and " Voluntary Schools " for those administered by bodies other than local education authorities.

The accommodation in schools is based on one or other of two factors ; for smaller schools the basis is the number of classes having a maximum of 40 pupils in primary schools, while for larger primary and secondary schools the basis is the number of forms of maximum size (primary 40, secondary 30) entering the school in any one year. To ascertain the maximum number of children to be accommodated in any school or department of a school based on " form entry," the number of " entry forms " is multiplied by the maximum class size and the result multiplied again by the number of years a child spends in the school, for example, three-form entry in a secondary school is 3 × 30 × 5, giving a total of 450 children.

The accommodation for the classes in nursery schools is based on units of a maximum of 40 children, with relative maximum numbers over and under three years of age.

The accommodation and numbers in special schools varies according to the type and extent of the disabilities of the children for which each school is provided.

The classification of schools and those attending them have undergone several changes ; schools, with a few exceptions, are no longer " all-age-schools."

Figure 1 is an attempt to illustrate the classification of schools under each of the two types of education controlled by local authorities. It should, however, be borne in mind that there are many possible variations due to special circumstances, such as in villages where populations are small, or in crowded urban areas. The main divisions in schools controlled by local education authorities are nursery schools, or a nursery department of an infants' school for children of both sexes from the age of two years up to five years, and in some instances to seven years. Compulsory education commences at the age of five years, and from that age until seven years attendance would be in infants' classes or separate infants' schools, which usually accept children of both sexes. Primary schools deal with children from 5 to 11 years, which comprise infants and junior departments. Primary schools are sometimes mixed, but more often for one sex only.

The main division is at the age of 11 years, when the transfer is made to secondary schools, in which the sexes are usually separate. The children remain at secondary schools until the leaving age of 15 (or 16) years, or until passing on to university or to advanced technical schools at 17 or 18 years. Secondary schools are of various types, as indicated in Figure 1, and are divided into three main types, namely " general," " commercial " and " technical " ; it is suggested that the general type may be sub-divided into (a) schools having a leaving age of 16, and (b) schools, such as the existing high schools and grammar schools, having a leaving age up to 18, intended particularly for pupils passing on to higher education. For the commercial and technical types a leaving age of 16 is envisaged.

The future new development is the " County College " or " Continuation College." These are intended to provide for the compulsory part-time continuation education and may possibly be combined with the existing senior technical schools and evening schools.

There are also " special schools " which care for children who need special educational treatment due to physical or mental defects, and the gradings referred to above do not necessarily apply.

The schools under private governing bodies tend to have rather different gradings and age groups. Figure 2 illustrates the broad divisions in education controlled by the " independent authorities " in relation to the age groups of the children. The kindergarten or infants school often keeps the child to the age of 8 years, after which it passes to a preparatory school, boarding school or junior section of a grammar school. The grammar schools and similar semi-public schools take children from 10 or 11 years up to 17 or 18 years. Children going to preparatory schools pass to " public schools " and similar schools at about the age of 13 years. From these schools, as well as from the secondary and technical schools previously mentioned, the universities are fed, and also the main vocational training schools. Most independent schools accept pupils of one sex only after the age of 8 years. There are, however, a few co-educational schools.

Although the building regulations do not apply to independent schools, the Education Act provides for the registration of these schools, and the premises of such schools have to be approved on behalf of the Minister and it may, therefore, be assumed that schools of this type should broadly conform with the same standards as those laid down for county and voluntary schools.

Sites—School sites need to be chosen carefully to provide the following factors : easy access from the homes of the children, quietness, sufficient area to provide adequate play areas and suitable orientation for the majority of rooms. Sites should be selected bearing in mind future developments under town planning

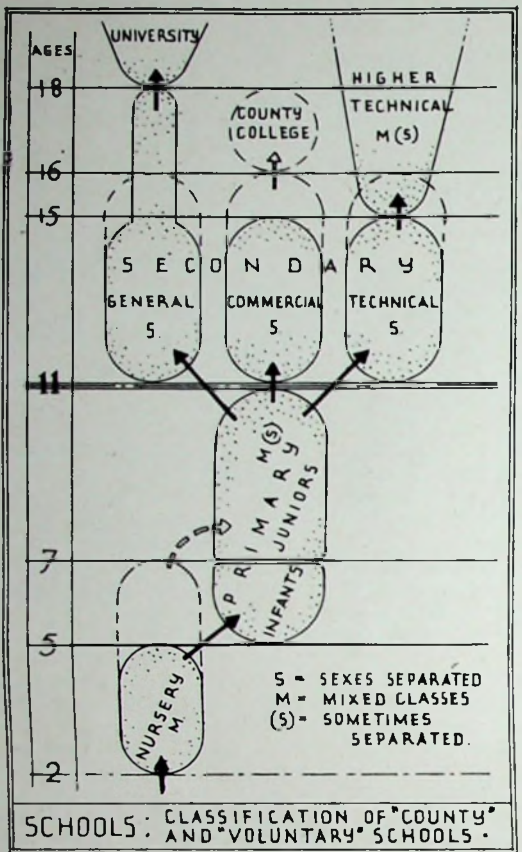


Figure 1

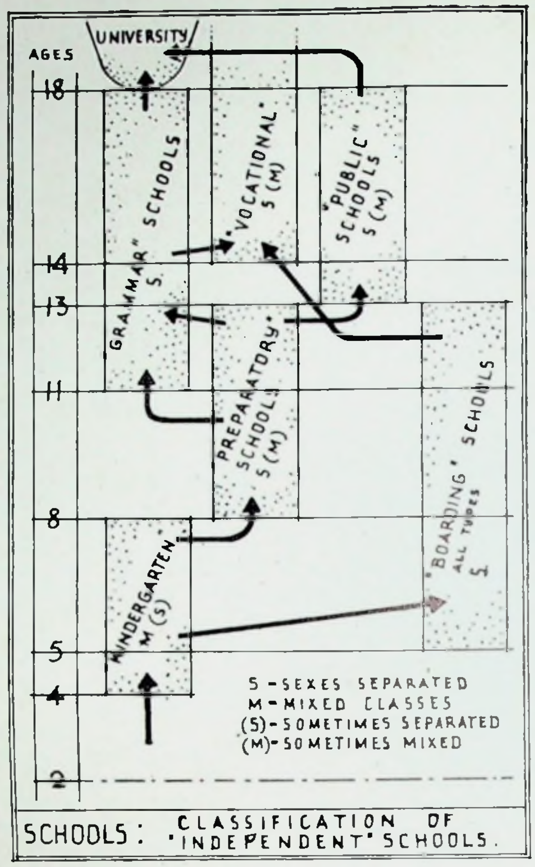


Figure 2

schemes. In the case of very young children, it is helpful if the school may be reached without crossing busy traffic roads, while for schools for older children, where the pupils are drawn from a wider area, convenient access by train, tram and omnibus is most essential; quietness is essential to permit of undisturbed working, so that close proximity to main roads, railways and noisy factories should be avoided. Thought should also be given to possible adjacent future developments which might be detrimental to a school. While convenient road access is needed, it is wiser to avoid placing entrances on main roads, in view of the possibility of children running out of the school grounds, without warning, into rapidly-moving traffic; Figure 3 shows a suitable treatment of entrances, which provides a pause between the gates and the footway and road. The outlook from buildings should be pleasant and value should be set on trees and other natural features; special consideration should be given to this matter in urban areas. Close proximity to public parks and playing fields is an advantage, more especially if playground areas attached to schools have to be small owing to the high cost of urban land.

Sites selected should be reasonably level, naturally dry, and preferably without excessive road frontage. Sloping sites involve considerable cost in building and particularly in the laying-out of play spaces. If there is a fall it should be towards the south or south-east. It is unnecessary in spread-out types of plan, having regard to economy, to maintain the same floor levels throughout.

When placing the buildings on the site, consideration should be paid to annoyance caused to surrounding houses by noise from school playgrounds and, if opportunity permits, the school building should form a screen.

Playgrounds should be placed well away from school buildings, the intermediate space being reserved for school gardens and open-air teaching.

The site areas required by the Regulations are related to the varying sizes of school and are specifically laid down. Additional areas have to be provided if the curriculum includes gardening and similar activities, and if schools have more than one department increases are also needed. Figure 4 illustrates diagrammatically the site areas required for "county" and "voluntary" schools of both the primary and secondary types; it should be noted that the areas are inclusive of playground areas. Figure 5 illustrates in a similar manner the requirements of nursery and special schools, which are also inclusive of play-spaces.

Access for vehicular traffic is essential for deliveries of supplies, including food and fuel and for removal of garbage. Roadways should be laid to easy gradients, properly drained and curbed. Adequate turning spaces properly planned near service entrances are essential for delivery vehicles.

The availability of services, particularly water and facilities for disposal of sewage, should be given very special

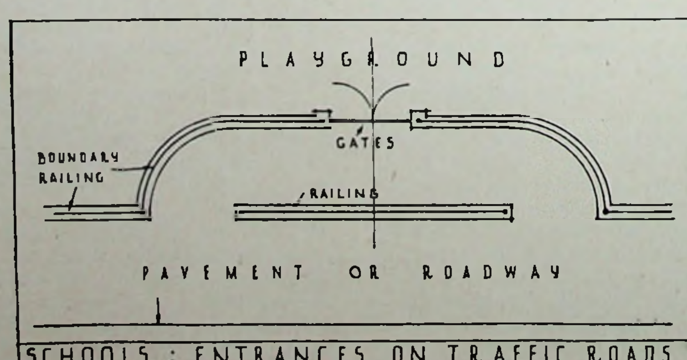


Figure 3

attention in the choice of sites. If public services are not available sufficient area for disposal of sewage is essential, and it should be noted that whole Sections (42 and 43) of the Regulations are devoted to very specific requirements relating to water supply and sewage disposal.

Trees, Gardens, etc—The surroundings of schools should be pleasantly treated, and laid out with flower borders, shrubs, grass and properly constructed and drained paths ; paths and roadways should be suitably surfaced to prevent mud being carried into the buildings in wet weather. Natural hedges should be used where possible, existing trees retained ; fences, when needed, should be simple, unclimbable and inexpensive.

Playgrounds—The Regulations lay down specific areas for playgrounds for each type and size of school. The shape of sites may of necessity be very different, but care must be taken to be able to fit on to a site the sizes and number of " courts " and " pitches " required. The Regulations define the area of a " court " as 110 ft by 60 ft and that of a " pitch " as 160 ft by 100 ft ; if, however, the site does not permit of these dimensions the width should never be less than 50 ft. The hard-surfaced areas should be limited to the " courts " or " pitches," and the remainder of the available space should be treated with grass, flower beds, etc. The " courts " and " pitches " should be paved with hard, dry and even surfaces, with slight falls to avoid central gullies ; the paving materials suggested are tarmac, asphalt or concrete, which are clean and dry quickly, and also are satisfactory surfaces for marking games courts. Any surface liable to become dirty or dusty should be avoided.

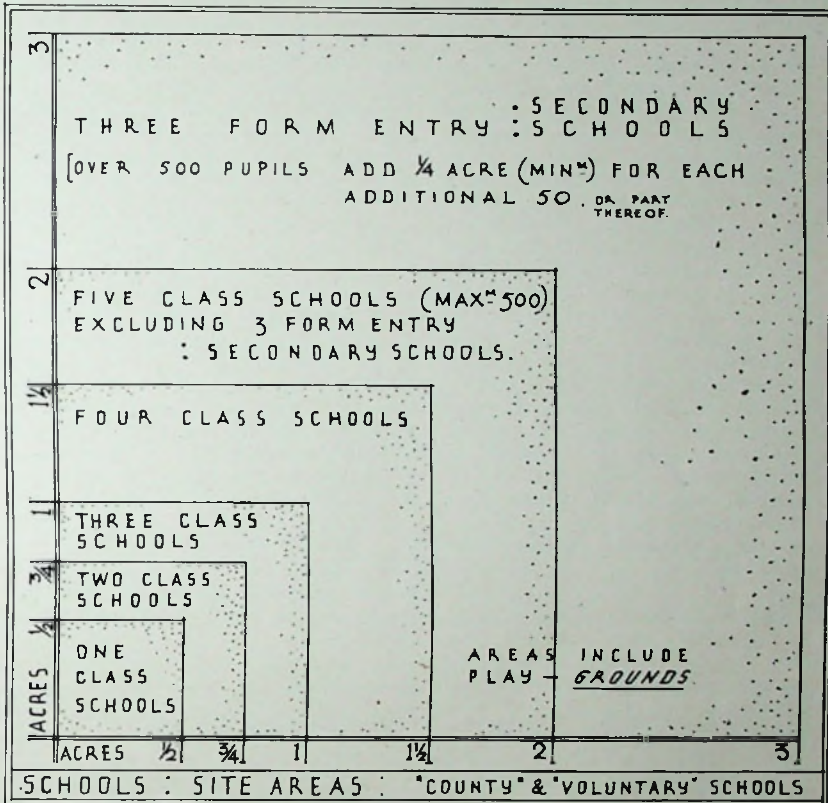


Figure 4

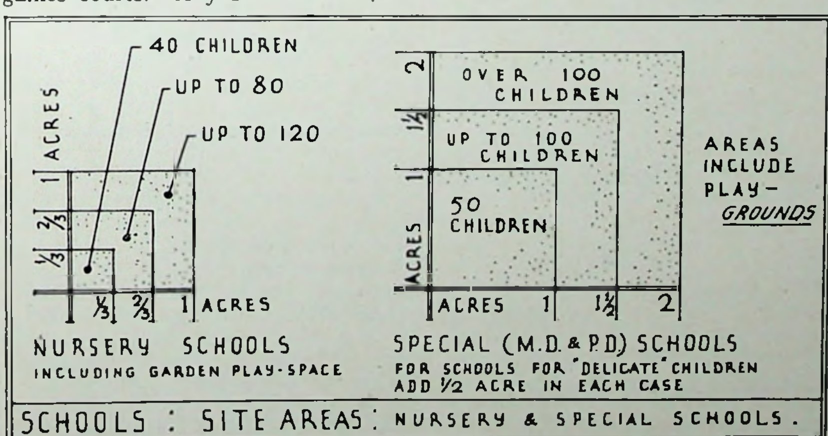


Figure 5

Playgrounds require separate entrances for boys and girls, but need not have permanent separation ; temporary barriers or white lines permit the whole area to be used by one sex at any one time for such activities as physical training. Separate playgrounds are preferred for infants in combined schools for infants and juniors, and such separation is essential if there are nursery classes ; infants, when separated, should have a hard paved area at least equal to half the area of a court. Easy access from playgrounds to lavatories and W.C.s is essential.

Proper provision should be made for drinking-water in playgrounds. The best types are those with an upward jet of water, eliminating cups and consequent contamination. They must be fixed at suitable heights for the size of the children using the playground, namely :

Ages	Height above ground
2–5	18 to 20 in
5–8	22 to 24 in
8–11	24 to 26 in
11 upwards	28 to 30 in

Wall-fixture fountains are preferable to independent or island types, as these are less liable to suffer damage. The jet type of fountain is not very satisfactory for nursery school children and for these it is often considered better to provide drinking cups. Adequate pressure control of the water is essential, and should be such that only a sufficient jet is provided for easy drinking, and not such that it may be used for squirting other children.

Figure 6 gives the recommended areas of playgrounds as suggested by the Regulations. The areas suggested apply to all schools, whether " county " or " voluntary," and for children of either sex.

For nursery classes there should be a play-space of not less than 200 sq. ft. for each child, of which 40 sq. ft. should be paved. Part should be covered by a roof and the remainder laid out with grass, flower-beds and paths. Sand pits, under supervision, are an asset for nursery classes and should be provided ; the details of these are given in the section on " Recreation."

Playgrounds attached to special schools catering for children suffering from disabilities are of the utmost importance, and Figure 7 sets out the requirements in relation to the size of schools and ages of pupils ; the design of such playgrounds often needs to be linked with the building in a more direct manner than for normal schools, particularly as the schools are often of the open-air type. Playgrounds should, in all cases, be given warm,

sunny aspects, and should be clear of projecting wings of the buildings. All playgrounds should be enclosed on street frontages, but not necessarily by high walls or close fences. Playgrounds should always be planned near the buildings of the department they are to serve to prevent disturbance to other departments or classes. Proximity to gymnasia is also advantageous for purposes of outdoor physical training in conjunction with indoor exercises.

Roof Playgrounds—In very crowded urban areas roofs may have to be used as playgrounds ; they must be kept as free from obstructions as possible, and have easy access and escape. It is usual to arrange that children from one upper floor of the school use the roof as their playground, and as far as conditions permit it should be made the correct area for that purpose ; the playground should incorporate adequate offices for the department using the space. The roofs must be properly and securely enclosed to prevent children climbing the parapets and to control balls and the like. A completely enclosed network of metal mesh, supported on steel trusses or ribs, is sometimes provided as shown in Figure 8 ; this permits of the playing of ball games which would be impossible in a crowded area without such protection.

Playsheds—Large covered playsheds are useful in all types of schools, but are not necessities except in the form of verandahs or loggias in nursery and special schools. They are, however, very useful as waiting-rooms, if there is any chance of children having to wait for admittance to the school buildings in bad weather ; this applies particularly in small schools in rural areas. Playsheds, when provided, may be used as open-air classrooms in summer time, if a suitable aspect is provided and they are of suitable dimensions for this purpose. Inexpensive bicycle sheds, open on one side, may be made to serve the same purpose as the " waiting-room " type.

Figure 9 shows two types of playsheds. Type A is for use either as a playshed or a shelter, and would, therefore, be of the most economical type of construction, but should have a seat and end walls. Type B is for occasional use as an open-air classroom, and therefore spans and bays need to be greater. Type A need not have a glazed roof, but in Type B it is essential, so as to light the inner part of the shed adequately. Type A may have any aspect, but it is preferable if it does not face the prevailing wind, while Type B is more useful if given a south-east aspect. Cross ventilation, as shown on the figure, is desirable, but cannot always be obtained, since the back is often a boundary wall. Care should be taken to ensure an adequate fall on the floors to drain any rainwater which drives in from the inside of the building as quickly as possible.

	1 TO 5 CLASSES	1 FORM ENTRY	2 FORM ENTRY	3 FORM ENTRY
PRIMARY SCHOOLS	C	P	ADD ONE COURT FOR 150 (MAX.) ADDITIONAL PUPILS · & ONE PITCH FOR OVER 150 DITTO	
INFANTS SCHOOLS			C C	P C
JUNIOR SCHOOLS			P C	P P
SECONDARY SCHOOLS		P	P C	P P

C = "COURT" (110'x 60') P = "PITCH" (160'x 100')

SCHOOLS: PLAYGROUND REQUIREMENTS "COUNTY" AND "VOLUNTARY" SCHOOLS

Figure 6

AGES	UP TO 50	50 - 100	OVER 100
UNDER 12 YEARS	C	P	P C
OVER 12 YEARS	P	P C	P P

C = "COURT" (110'x 60') P = "PITCH" (160'x 100')

SCHOOLS : PLAYGROUND REQUIREMENTS SPECIAL (P.D. & M.D.) SCHOOLS

Figure 7

Playing Fields—Playing fields have to be provided for all schools except nursery schools and certain special schools. If possible they should be provided adjoining the schools themselves, but in many areas this may be quite impossible, and play-fields must thus be obtained in accessible positions. It is sometimes convenient to assemble together the requirements of several schools, and this may permit of a reduction in total areas needed.

The areas required for Primary Schools are half acre for up to 50 pupils, one acre for 50 to 100 pupils, with the addition of a quarter of an acre for each additional 25 pupils.

The areas for Secondary schools are :

One-form entry	5 acres
Two-form entry	9 acres
Three-form entry	14 acres

Figure 10 summarizes the requirements for playing-field areas as required by the Regulations. Reference should be made to the section on " Recreation " which sets out sizes required for various games, but it should be noted that some spaces of indefinite sizes are needed for practice pitches, long jumps, etc., which can be placed on odd spaces of suitable sizes in playing fields. Additional spaces and pitches are needed to rest the ground and maintain it in a playable condition. Care should be taken to avoid close proximity to trees. Sites which are reasonably level should be sought to avoid excessive cost in preparation.

The information on the planning requirements of various games given in the section on " Recreation " is for general purposes ; for school purposes these may frequently be reduced with advantage, more especially for Primary Schools.

Facilities for Changing—This problem is greatly simplified if the playing fields adjoin the school, when advantage may be taken of the normal cloakrooms and lavatories or gymnasium changing rooms ; but it is desirable to extend the normal accommodation somewhat and to add shower-baths, foot-baths, and, if possible, a small plunge-bath. The same changing rooms might be used for games and a swimming bath, if both are situated near enough together. If, however, playing fields are provided centrally for a number of schools, or they are far from the school itself, changing rooms or sports pavilions must be provided in connection with the playing fields. (See also under " Gymnasium " later in this section.)

Sports Pavilions—These vary considerably in size and character according to the type of school and whether near or far from the school buildings. They used not, in fact, to be more than changing rooms, together with the necessary lavatory and W.C. accommodation, and with apparatus stores. For Secondary schools more

elaborate buildings are frequently required, including refreshment facilities for one or two visiting teams and a similar number of house teams. Opinions vary in regard to the number of changing rooms which should be provided. A frequent provision is a large room for junior pupils, one or more smaller rooms for senior pupils, and a room for visiting teams. Each room should have at least shower baths and lavatory basins, with hot and cold water, and preferably some ordinary baths or a plunge bath in addition. Reference should be made to the Section on "Sports Pavilions" but bearing in mind always that the needs of schools are more simple than for pavilions used for other purposes. The changing rooms can be very simply fitted up; wooden seats round the walls and island seat fittings, if the rooms are sufficiently large, with clothes hooks above and shoe racks under the seats are the chief needs. Lockers are generally unnecessary. Ample ventilation and light are very important, as also are floor materials; the latter should be such that they are easy to clean and do not suffer famage from studded boots, mud or wet feet.

The refreshment facilities, when required, usually consist of a large room to seat the necessary number of persons at one time, based on an allowance of 8 to 9 sq. ft. per person, together with a small combined kitchen and service room; little actual cooking is required, as meals are generally

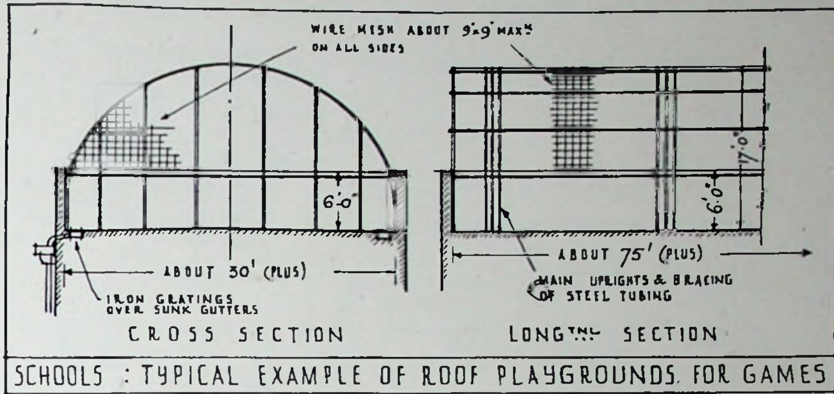


Figure 8

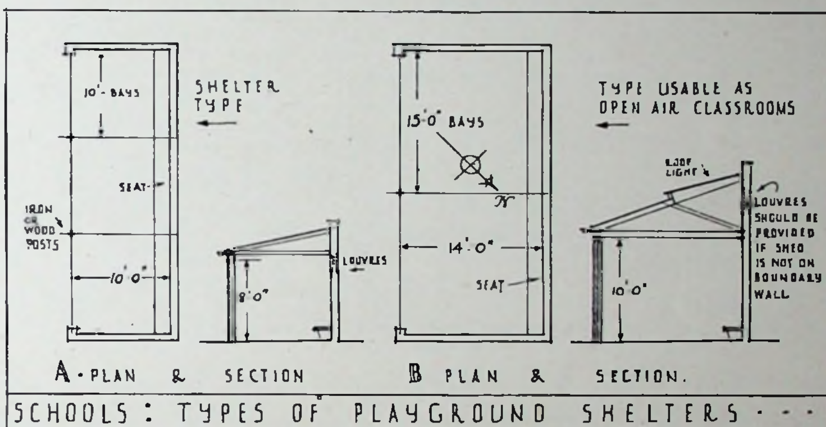


Figure 9

SCHOOLS OR DEPARTMENTS	UP TO 50 PUPILS	50-100	EVERY ADDITIONAL 25	1 FORM ENTRY	2 FORM ENTRY	3 FORM ENTRY
PRIMARY	1/2	1	1/4	A	C R E	S
SECONDARY	A C	R E	S	5	9	14
SPECIAL UNDER 12 YRS	1/2	1	1/4	DOES NOT APPLY TO SCHOOLS FOR "DELICATE" CHILDREN		
SPECIAL OVER 12 YRS	1 1/2	3	3/4			
THE ABOVE MAY BE REDUCED (WITH APPROVAL) FOR 2 OR MORE SCHOOLS OR DEPARTMENTS SHARING PLAYING FIELDS						
SCHOOLS : PLAYING FIELD REQUIREMENTS : ADDITIONAL TO "SITES"						

Figure 10

ready cooked or necessitate only the boiling of water for tea; good and plentiful china and glass storage is important, with ample draining-board space near the sink. The chief need, otherwise, is table space on which meals may be prepared so that a large number may be served quickly.

It is better if changing rooms do not open directly from the main room used for refreshments, and cut-off lobbies are essential between lavatories and the main room, although they may lead directly out of the changing-rooms. Pavilions are often so placed that surrounding terraces or verandahs may be used for scorers and spectators watching a game on the most important pitch; if such are to be used for spectators it is better that they do not face towards the south or west to avoid sun shining directly in the eyes of spectators.

Games Store—Adequate and properly fitted up storage is needed for games equipment either at the school or at the playing fields. The amount and type of accommodation needed will vary greatly from school to school, according to the amount of interest given to organised games. Figure 11 gives general details of the way in which suitable racks may be provided to meet the needs of different games. Cricket bats require a shelf with raised edge about 5 in wide, with a similar shelf fixed at 2 ft 3 in above it and perforated with holes at 4 in centres which should be 3 in diameter for bats and 2 in diameter for stumps. Cricket, hockey and similar balls can either be kept in cupboards or on racks; it is advantageous if the balls are raised off the shelves to permit of adequate air circulation by resting them on three-pointed supports. Footballs and netballs can be stored on shelves about 11 in wide with a high front edge; holes 2 in diameter and 10 in centres should be made in these shelves. Sticks for rounders may be held in wall clips spaced at 6 in centres. Hockey sticks require 3 in diameter holes spaced 4 in apart in a rack placed above a sloping base as shown in Figure 11; a shelf 1 ft 2 in will accommodate three rows of sticks. Tennis rackets require a shelf about 13 in wide with 2 in diameter holes placed at 3 in centres. All these shelves and fittings must be strongly made and very securely fixed to the walls. Cupboards are also needed for storage of cricket pads, gloves, score books and similar smaller articles.

Swimming Baths—Except in some secondary schools and in a few "voluntary" schools, swimming baths for the exclusive use of a school are not provided. It is usual to arrange for attendance of classes at public baths or to have a bath to serve a group of schools in an area. It is desirable when swimming baths are provided, that they should be of the "covered" type, as the building may be used for certain other physical activities in the

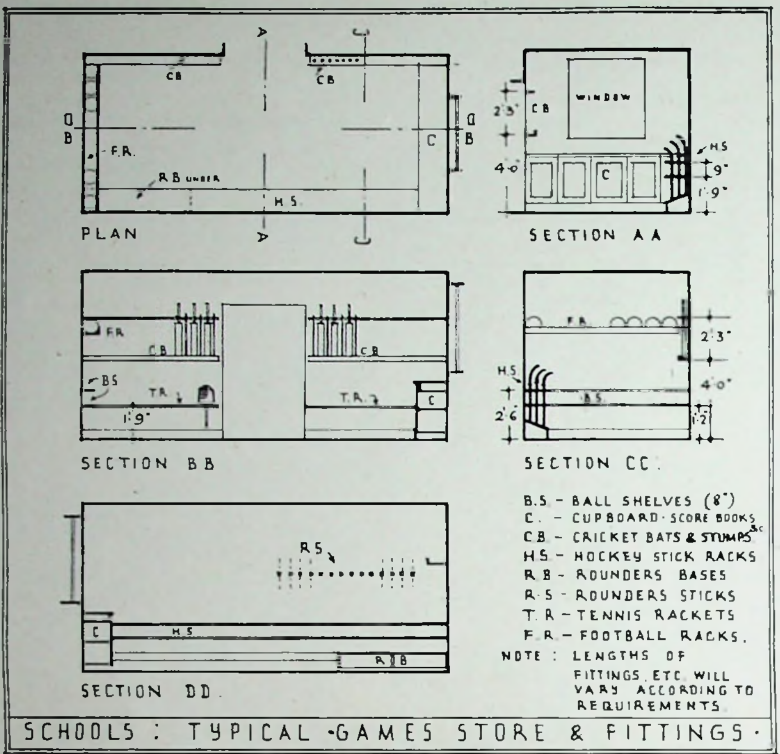


Figure 11

winter months if the bath is covered by a temporary floor. Swimming baths, both open-air and covered types, are fully discussed in the two sections devoted to these subjects.

Bicycle Sheds—Bicycles have to be stored in most schools, but especially those in suburban and rural areas and in secondary and technical schools where pupils are drawn from wide areas. Bicycles should be accommodated in covered sheds; these sheds should be placed in the school grounds, not too near the entrances from the road, and where supervision can be provided, but they should not encroach on playground areas. It is usually desirable that the sheds should be capable of being locked during school hours, although this does not necessarily mean enclosure with solid walls, but this is advantageous in exposed districts liable to driving rain. The average bicycle is 6 ft long, 18 in across the handle-bars and 16 in across the pedals. Storage may be arranged in a variety of ways, some of which are shown in Figure 12; the arrangements shown are based on the use of racks in which alternate machines are raised, and unless systems such as these are used spacing must be increased to 1 ft 7 in or 1 ft 8 in instead of 12 in, with a consequent considerable increase in the size of the building. For younger children systems involving the lifting of machines should be avoided and preference given to methods in which both front and back wheel positions are horizontal and fixed. Diagram A shows the racks arranged diagonally, which reduces the overall width of the shed. Diagram B shows the machines placed at right-angles to the outer walls, and in Diagram C the machines are placed facing one another on either side of a central rack. Spacing between rows of machines should be at least 6 ft in the clear, allowing 6 ft 3 in for each row of machines. The central rack type, as in Diagram C, involves a considerable span if it is to be enclosed and allowing access ways on each side. There are many special types of rack in which machines are tipped up and staggered in various ways, but most of them are not suitable for children's use, although often more economical in space. Care should be taken to select racks which will withstand rough usage and produce a minimum of damage to the wheels of bicycles.

Suitable equipment for bicycle sheds is manufactured by a number of firms, each of whom have slightly different details as regards material and design of the actual racks or holders for the machines. The building acting as the shed may be of light construction and does not necessarily need brick walls with concrete or tile roofs. If sheds open on one side are used, the open side should be away from the prevailing wind and the depth sufficient to provide proper protection. Eaves heights should not be less than 6 ft 3 in.

Pram Sheds—It is necessary in Nursery Schools to provide perambulator sheds. It is desirable that these should be based on the use of perambulators although it is probable that many of the vehicles will be of the "folding pushchair" type which require rather less space. The pram sheds may be in the form of open-fronted sheds, but are better if designed to be completely closed to keep rugs and interiors of the prams dry during wet weather. Figure 13 shows two methods of arrangement of prams in sheds. Diagram A requires a greater span as the corridor space needs to be at least 6 ft wide, whereas that shown in Diagram B may be reduced to less than 3 ft; the total area required for both types is, however, much the same, as Type B requires a greater length for a given number of prams.

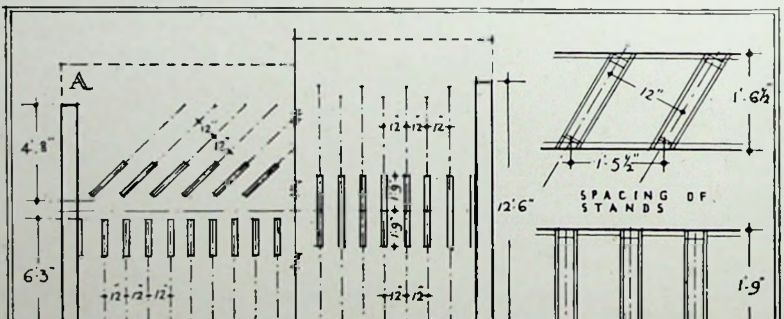


Figure 12

Attached to or as part of the pram shed, a covered and preferably enclosed space for large toys used in the play-ground should be provided.

Storage for garden tools both for maintenance of the garden and for use of the children may with advantage be associated with the pram and toy stores. Tool stores are also needed in all types of schools where gardening forms part of the teaching. Tools such as spades, forks, hoes and rakes should be stored in racks or hung on pegs designed to permit of proper spacing.

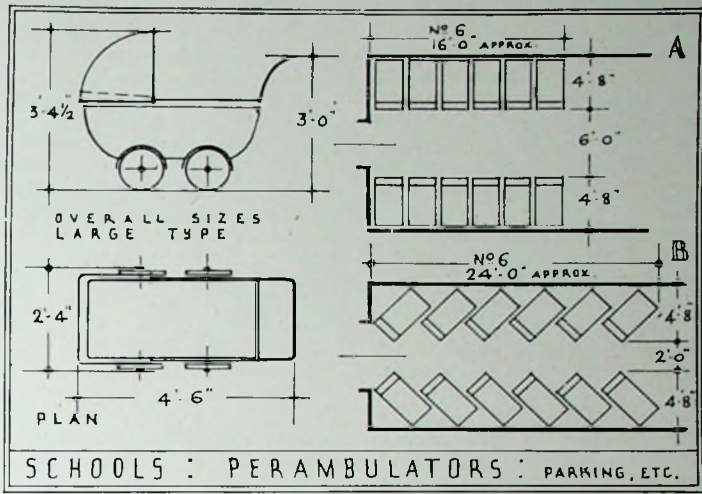


Figure 13

Aspects—Sites should be open enough to obtain the maximum benefit from sunshine. South-east is the best aspect for classrooms, although in warm and sheltered localities rooms facing in a more easterly direction may be used. South-westerly rooms get less sun in the early part of the day, while later in the day they are apt to be hot, and excessively sunny, which is trying to the eyes of pupils. The remaining aspects are suitable for other purposes, such as cloakrooms, cookery, art and science rooms, in which direct sunshine is of less importance and even undesirable. Figure 14 compares the sun in rooms facing south-east, south and south-west. Diagram A is a sun-range figure for London. Diagram B shows the south-east aspect room, and it will be seen that direct sunlight enters the room long before lessons start, which is usually at 9 a.m., thus warming and cleansing the room before the admission of the children, who may then start work in a bright, sunny room; also, the sun continues to shine into the room until 4 p.m., when most classes end. It will also be seen from the figure that the afternoon or hottest sun does not shine very directly into the south-east room. Diagrams C and E show the effect of the sun in a south aspect room; the room has direct sunshine all the working day, but it shines too much on the desks—particularly during the summer months—which is trying to the eyes and necessitates screening. Diagram D shows the south-west aspect room in which the sun does not fully penetrate until after the morning classes have begun, and is directly on the children during the hottest hours of the day.

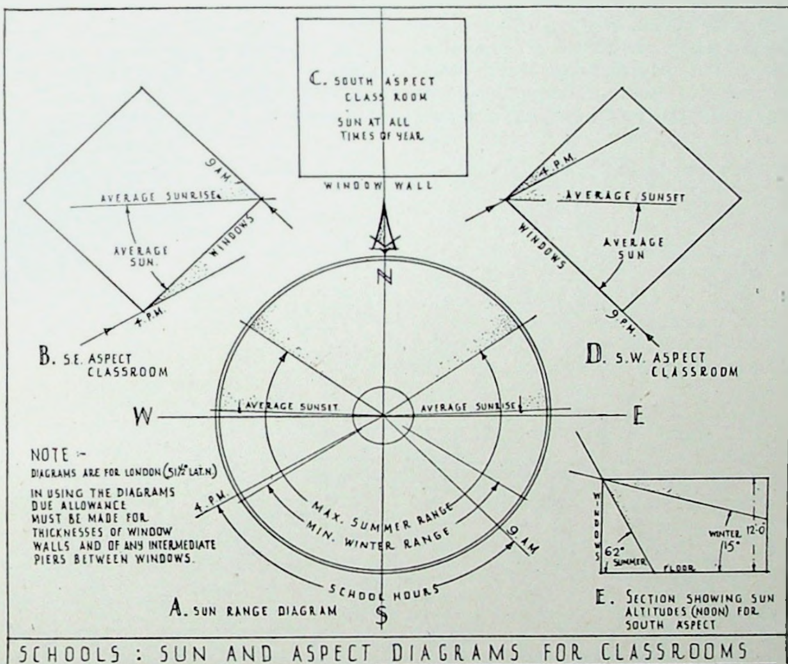


Figure 14

Another disadvantage of windows facing south-west is that the heaviest rains often come from that quarter, thus, making the opening of windows more difficult. South-west aspects show slight savings of artificial light in the winter months, but this is of small importance as the school day generally ends at 4 p.m., and evening classes take place mainly in winter and after darkness has fallen.

If schools are planned on open-air or semi-open-air lines, aspect is a more difficult problem, and orientation depends largely on the type of plan adopted for the rooms; the object is to ensure that all teaching rooms have direct sunshine during part of the working day in the manner least uncomfortable to the occupants.

General Planning—One of the governing factors in the planning of schools is the number of storeys on which the accommodation is disposed. In general, there appears to be a tendency to use single-story buildings for nursery, special and primary schools whenever land areas permit, which is, broadly, in all except very congested urban areas; secondary schools, however, are often planned as single- and multi-story buildings, the latter tending to be the more usual. Single-story buildings tend to become very spread out if the school is large, thus involving long circulations and more difficult supervision. Other factors to be considered in the decision on the number of stories are the site contours, type of construction, method of daylighting to be used for classrooms, and local preferences. The Ministry of Education do not favour more than two stories. There is no need to plan schools on one level throughout if sites can be developed more economically by the use of various levels for different parts of the school. It should, however, be borne in mind that single-story buildings permit lighter types of construction being used, and this is of importance in prefabricated types of construction such as that advocated in Post-War Building Studies No. 2 (H.M.S.O., price 6d.).

Plans may vary greatly in shape; spread out, very compact and built round courts or quadrangles. It is important to anticipate that extensions may be needed at some later date, and consequently very compact

plans, especially if built round a courtyard and closed on all sides, are difficult to extend. Schools grouped round quadrangles usually enclose a space which is too small to be really valuable, while the proper lighting of some of the rooms may be very difficult. Varying uses of school buildings during and after school hours also affects general planning greatly.

Analysis of general circulation in all school plans is dependent, in the first instance, on a realisation of the relative importance of various parts, and the inter-relationship of parts ; and secondly upon the aspects needed for various rooms ; the classroom aspect is, by general agreement, towards the south-east, and this point being settled, the circulations will depend on the relative importance of those rooms to which, at some time during the day, all or some large proportion of the pupils have to go *en masse*, together with the quietness and usability of rooms where classes are held.

Figures 15 and 16 illustrate four typical school plans ; there are many variations of the type shown in Diagram A of Figure 15, in which the courtyard is not totally enclosed, but the rooms planned on three sides, which are usually capable of extension more readily than the one shown. Another type of courtyard plan is that in which the Hall is placed centrally, with small courtyards on each side, round which are arranged the teaching rooms ; in this type the courtyards are generally undesirably small. It will be seen from Diagram A that certain of the classrooms near the corners of the plan are very difficult to light adequately. Diagram B shows a type of asymetrical plan in which all the large rooms which need greater height than teaching rooms are grouped together on the east of the plan, and the classrooms arranged in another group on the north of the plan ; the two wings thus formed make good protection from the colder aspects for the playground.

Diagram C of Figure 16 shows a type of lay-out based on a main " spine " corridor, along which are spaced the classrooms on the south-easterly side and the practical rooms on the opposite side ; this plan might be used for various aspects, more especially dependent on the shape of the classroom units, in order to provide left-hand light on the desks. A plan based on room units used in this manner has a very large amount of external wall, and circulations tend to become very long. It is probable that there is little to be gained by separate classroom units, from the point of view of lighting, as this should be provided mainly from one side, the left of the desk, in normal classrooms. This type of plan, is, however, useful in prefabricated types of construction. A plan similar to this, but with the classrooms attached to one another, is very usual, and the distance from the communal rooms, such as the hall, is thus less than in a lay-out such as that shown in Diagram B.

Diagram D illustrates another spread-out type of plan based on a main corridor leading from the communal rooms to the teaching rooms, off which are wings containing classrooms and practical rooms. Such a plan lends itself to special types of lighting and unit construction, as rooms having similar spans and bay-spacing can adjoin one another ; also by simple movements of partitions internal changes may be made with little difficulty. All the types shown in Figures 15 and 16 except type A are capable of extension, should this be necessary at any time.

Figure 17 is an attempt to illustrate in analytical form the general relationships between the various rooms and parts of a school. The main entrance should give immediate access to the assembly hall and to the head teachers' rooms. The children's entrance, if separate from the main entrance should lead immediately to the cloakrooms, with which should be grouped lavatories, sanitary offices and drying rooms. The circulation should then continue from cloakrooms to teaching rooms, both classrooms and practical rooms, which should form one main group of accommodation. The cloakrooms should also be so placed that they are readily available for use with the assembly hall. The gymnasium, with its changing rooms, needs contact with the teaching rooms, but should also be placed in close relationship with the playground and the playing fields if the latter are on the same site. The lavatories adjoining the cloakrooms should also be easily accessible from the playground. The dining room, with its kitchen and ancillary rooms, should form a group, and since its use is mainly only once in the day, it may well be separated from the other groups. Stores, to which vehicular access is needed, are required in the kitchen block, and also for the practical rooms, especially where wood- and metal-work form a part of the school work.

The detailed requirements of each group and of each room are set out in the paragraphs which follow under separate headings for each form of

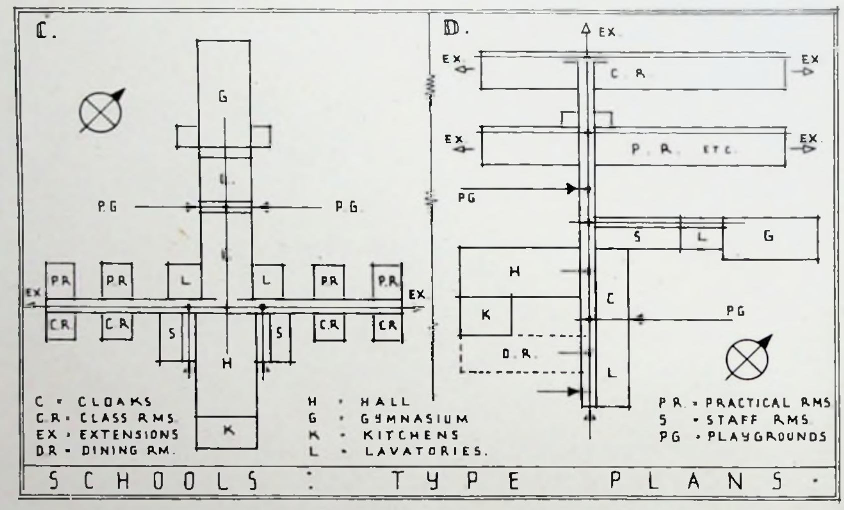


Figure 16

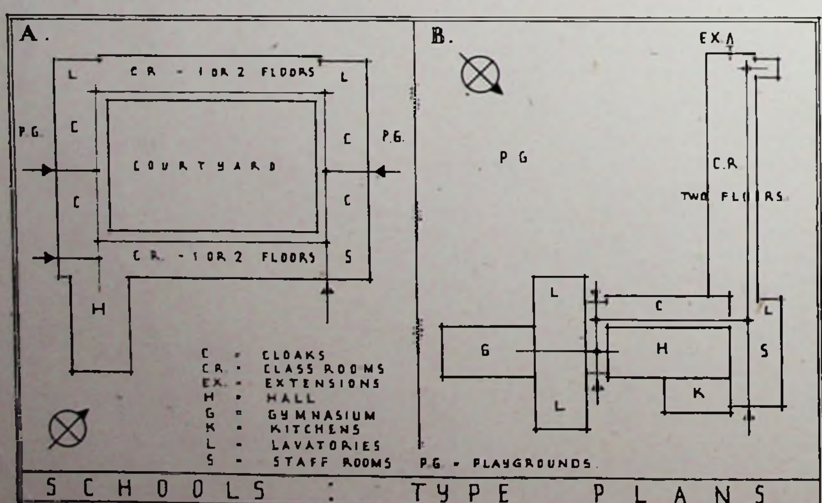


Figure 15

accommodation. The Building Regulations call special attention to the need to take full precautions for the safety of the occupants of schools, and refer in particular to fire risks; many risks can be avoided by careful planning, especially in regard to staircases, corridors and facilities for escape generally.

Height Grouping of Children—The heights of children of age groups in each type or department of a school has considerable influence on the

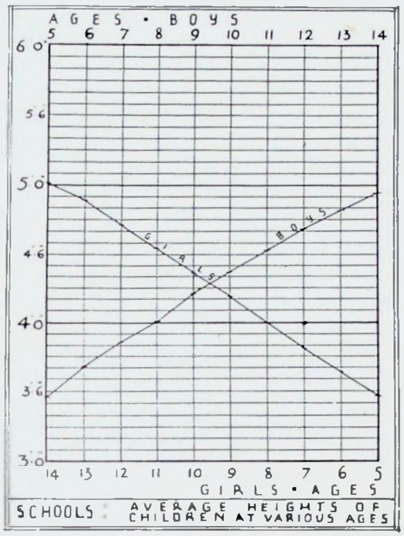


Figure 18

installation and size of equipment and furniture. It must be admitted that in any age group there are wide variations above and below the average height which must be taken into account in regard to seat and desk levels, but is of less importance in relation to other equipment. The dimensions on which Figure 18 are based are averaged from a number of sources, and heights in different parts of the country may be found to be slightly different.

These average heights must be used for fixing the heights of W.C. seats, cloakroom fittings, towel rails, lockers, and all similar fittings and fixtures. Correct heights of all such fittings are of the utmost importance if full benefit is to accrue. For seating and the working heights of desks and tables the correct height for each child is of the maximum importance to ensure good health and working comfort, and this matter will be discussed in greater detail in later sections on teaching rooms. The heights of children are not given in the Figure for ages over fourteen years, as for that age and onwards average normal adult height for fittings and fixtures begin to be satisfactory. It should be noted that although in the younger age groups there is little difference in the sizes of boys and girls, in the later years the girls grow more rapidly than the boys, but ultimately, after school age, the boys' average exceeds that of girls.

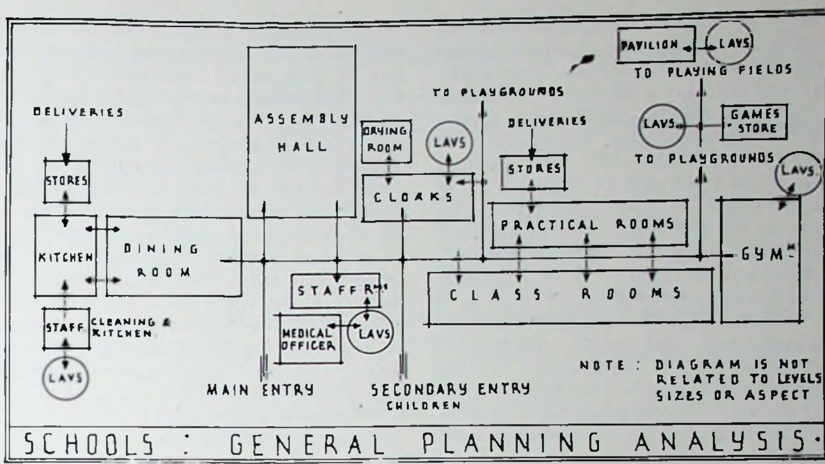


Figure 17

Entrances—Where both sexes and more than one department are accommodated in one building, separate entrances for each section of the school are essential. Entrances must not lead directly into an assembly hall or into any teaching room, nor should they be used as cloakrooms. In large schools more than one entrance may be needed, and several exits are essential. Service entrances for deliveries should be quite separate from those giving access to the school proper. External doors of entrances should open outwards, and external steps must have ample landings between the doors and the top step. Outside steps should be protected to prevent slipperiness in frosty weather. An outside artificial light point is essential. Doors should be at least 4 ft 6 in wide, in two leaves, and are better if the upper part is glazed, unless there is a lobby with internal glazed doors, and the outer doors are kept open during normal school hours. A mat-sinking of a large size is desirable. Facilities for anchoring the doors open are needed. School halls are frequently let for meetings, etc., after school hours, and therefore corridor approaches and exits must conform to established regulations for places of public entertainment. The main school-entrance should give access to the head teacher's room or rooms, in the case of mixed schools, and, unless the assembly hall is placed away from the head teacher's room, this entrance can well serve as the main public entrance to the hall; it is generally desirable that the head teacher's room should be near the hall, and the main entrance is, conveniently, of dual purpose. The main entrance should not be cramped in area if it is used in conjunction with the hall for either school functions or for public lettings of the assembly hall. Care should be taken that doors opening outwards do not obstruct footpaths or playgrounds; they should therefore be set in recesses or projecting "porches."

Staircases—In general separate staircases must be provided for each department and for each sex. At least two staircases are essential in every multi-story building; it is desirable that such alternative staircases be at opposite ends of the building, but they should not be more than 200 ft apart, a requirement which may mean that additional staircases have to be provided. Staircases must have adequate daylight and ventilation, which can only be provided by having at least one external wall. Construction must be fire-resisting and of non-slip surface materials; staircases are best constructed of concrete with hardwood treads, or of artificial stone with inserted non-slip strips near the nosings. The minimum width should be 4 ft and the maximum number of steps in a flight should be fourteen; winders must not be used, nor must landings be broken by steps; short flights of steps are undesirable, as children are apt to jump them. When small changes in level are essential, ramps of very flat gradient should be considered. Treads must be 12 in wide with 5½ in risers, or 11 in treads with 6 in risers. Continuous handrails should be provided on both sides; handrails must be very rigidly fixed and are better if sunk into the walls, although this treatment is costly.

The position of staircases should be considered in relation to the hall, but the most important factor is rapid exit in case of emergency. Staircases should be placed at the ends of wings of the buildings. Reference should be made to the Home Office publication, "Fire Precautions in Schools" (H.M.S.O., 1935). External staircases should be avoided. The Building Regulations stress the planning of artificial lighting of staircases to ensure that treads are between 25 and 75 per cent in shadow, and that the edges of the treads are easily distinguishable.

Corridors—The position of corridors in relation to classrooms varies in different schemes, partly due to local circumstances and also for reasons of site aspect. It is essential to give sunny aspects to classrooms, and therefore corridors are usually on the opposite side of teaching rooms, and in this position provide a protection against

cold. Only in exceptional circumstances in which the warmer aspect coincides with the direction from which the prevailing winds blow should corridors be on the sunny side. Open-sided verandahs as approaches to rooms were, at one time, very popular and, if used, should be placed on the warmer side of the buildings ; this type is on the whole, however,. unsatisfactory, and leads to complaints of wind and draughts ; it makes classroom lighting more difficult, and is of no value as a protection to classrooms against wind and rain. Widths of corridors should be decided having regard to the number of rooms to be served, but should never be less than 6 ft. Good lighting of corridors both natural and artificial is essential. It is sometimes desirable to increase corridor widths as entrances are approached, or where persons from many different parts of the building may need to congregate, as, for example near the assembly hall. Very long corridors should be broken up at intervals to reduce draughts and noise with doors swinging both ways. *Cul-de-sac* corridors should be avoided whenever possible.

Corridors are often used as exhibition spaces for such articles as models or handicraft work requiring more space than would be occupied by such articles as drawings or pictures hung on the walls ; if corridors are to be put to these uses a proportionate width increase is necessary to allow a 6 to 8 ft clear circulation space ; or, alternatively, exhibition bays may be provided. When students' lockers are provided in corridors, the latter must be increased by the dimensions of the lockers and to allow standing spaces for those using the lockers ; this is likely to involve an increase of at least, 2 ft. Rooms from which doors open outwards into corridors must be planned to avoid the doors obstructing the corridors. In other countries, cloakrooms are often formed in corridors and this matter will be discussed in the paragraphs on cloakrooms.

With extension of the use of tables and chairs, in lieu of desks, the locker problem is intensified ; if table drawers and desk lockers are not provided book storage has to be found elsewhere. There are objections to lockers being placed in classrooms or to the use of desk lockers, in that the pupils must always return to their own classrooms after each lesson-period to put away or change books ; nor can a book be fetched from a classroom without disturbance ; all these difficulties may be avoided by the provision of lockers in corridors or by planning separate locker rooms or recesses, or if lockers are placed in cloakrooms ; the last arrangement is generally the least liked. Lockers for normal book storage purposes need not be more than 12 in overall from back to front, but either width or height should allow for an attaché case or satchel to be placed in the locker, and this needs about 16 in or more. Figure 19 illustrates two lay-outs for lockers ; firstly, those in recesses, which are formed between piers or stanchions; the lockers are fitted in flush or slightly projecting into the corridor, according to the thickness of the partition in relation to the size of the piers. The overall height of locker fitments should not be too great for children to reach, or when a full glazed partition is used between the corridor and classroom.

The size of book lockers varies considerably according to the grade of school ; small lockers 12 in by 12 in by 12 in are adequate for junior classes, increasing to 12 in by 24 in by 12 in and fitted with an intermediate shelf for secondary and technical schools, where students need more and larger size books, and may have, in addition, instruments or tools. The number of tiers of lockers is dependent on the length of walls available, but lockers must be kept within easy reach, bearing in mind the average heights of the children to use them in each type of school ; the lowest row of lockers should be at least 9 in and better 12 in above the floor, and the space so left should be clear of all obstructions to permit easy cleaning. It will be found that while a comparatively low glass level of glazed partitions between corridors and classrooms limits the number of lockers that may be placed in this position, there are many other parts of school buildings where considerably more wall space is available against which lockers may be placed. Lockers on both sides of corridors are not desirable but may become necessary in schools which are used for day and evening students in order to obtain sufficient wall space. When possible lockers should be placed against the classroom walls and thus opposite windows, as it is difficult to see into lockers placed below external windows. If a scheme of this kind is accepted, the shelf or space above the lockers should not be used except as a place for use in connection with the lockers. The other example shows a substitution of lockers for the partition between the corridor and the classroom in order that books may be available from both sides ;

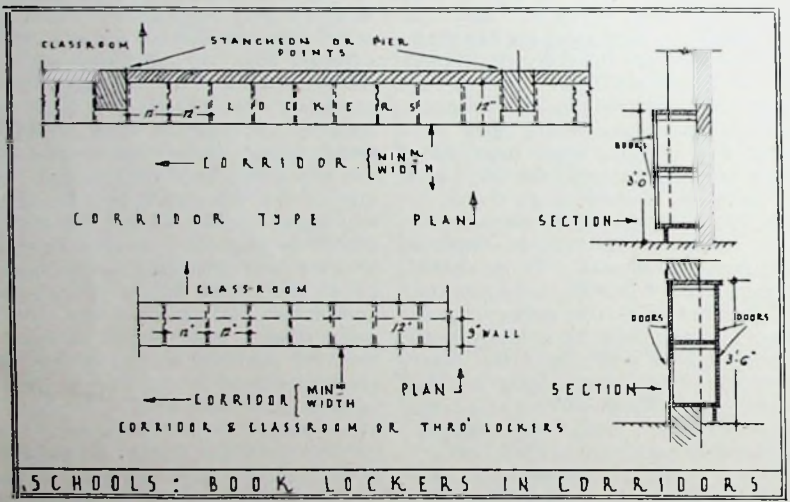


Figure 19

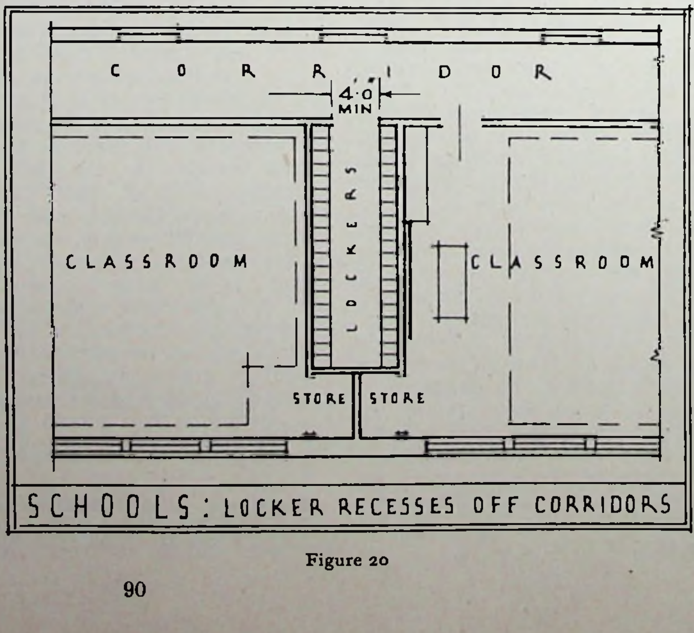


Figure 20

any depth of locker may be used in this position, and if greater than the partition wall thickness as shown on the diagram a useful sholf may be formed on the classroom side.

Glazed recesses or cupboards have frequently been installed in corridors of schools in other countries for display purposes ; such display cases should be kept well above floor level and the doors should be fitted with locks.

Figure 20 illustrates a method of providing locker space, without using the corridor itself, by means of recesses designed specially for the purpose. The length of the recess is dictated by the number of lockers required for each classroom and the size of the children using them, as the latter determines the number of tiers. The remaining space forms very useful storage, which may be divided between the two adjoining classrooms. The width of the recess should be such that there is at least 4 ft between the faces of the lockers and a rather greater width is desirable.

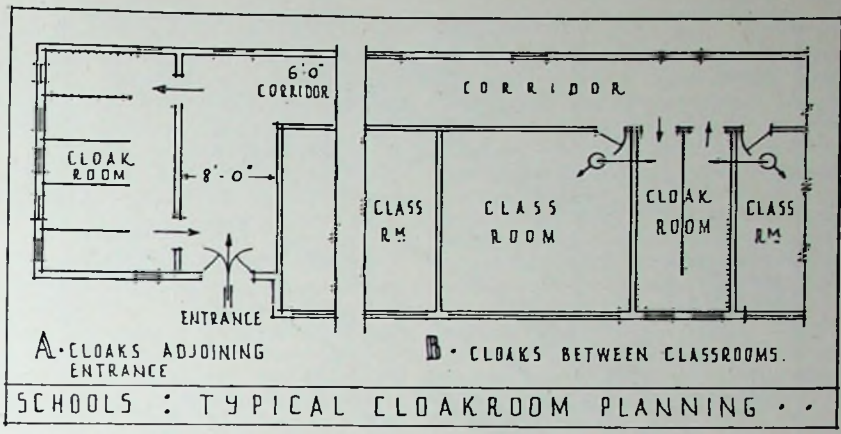


Figure 21

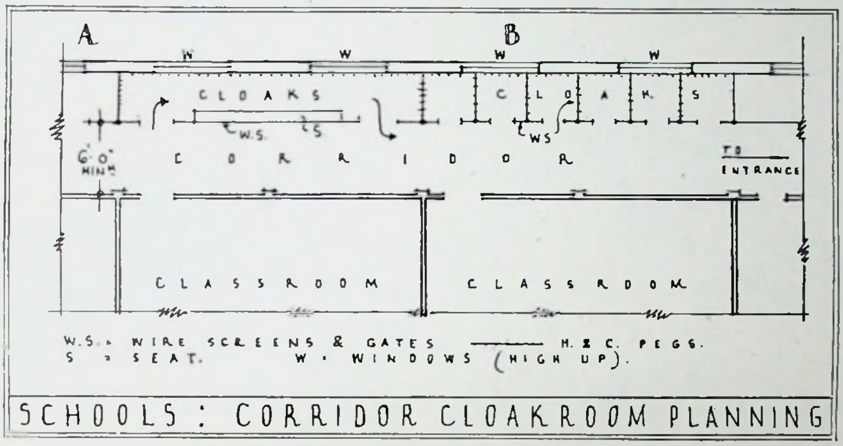


Figure 22

Cloakrooms—Cloarkroom requirements vary with each type of school, although there are many factors which are constant. Each sex must have a separate cloakroom, except in nursery and infants' departments. There are various positions in which cloakrooms may be placed in relation to the entrance and the classrooms. The more general method adopted is to plan large cloakrooms near the entrances of each department, or if the department is very large a series of cloakrooms, as shown in Figure 21, Diagram A. There are, however, indications pointing to the adoption of methods somewhat similar to those used in other countries ; namely, planning small cloakrooms to serve two classrooms only, between pairs of classrooms, as shown on Diagram B, or even single class cloakrooms attached to each classroom. If the first method, Diagram A, is adopted, the cloakrooms must adjoin entrances and be accessible from corridors or lobbies and also be quite separate from all rooms used for teaching purposes. It is desirable that there should be separate doors or gates for ingress and egress to avoid confusion and crowding ; ample space should be allowed in the corridors adjoining cloakroom entrances ; if the cloakrooms are large, several doors may be required. Through ventilation and good light are essential. Windows should be placed at the ends of gangways between clothes racks and not so that one row of fittings shields the light from the next. The main objection to the arrangement shown in Diagram A is that the concentration of large numbers of children at one or two places tends to cause congestion, excessive noise and waste of time. There is no doubt that experiments in cloakroom arrangements attached to locker rooms and classrooms are still needed to overcome the disadvantages of the present systems. The second method, illustrated in Diagram B, is rather more costly, but avoids crowding into one large room, separates the classes for easier supervision and permits some rooms to be closed if part of the school only is in use as, for instance, for evening classes. The Ministry of Education Memorandum on the Building Regulations suggests dispersal of cloakrooms in Primary Schools and draws special attention to the need for careful planning of cloakrooms and lavatories in those schools used for evening or other social activities to avoid opening up the whole of the school during these periods. Doors or gates which can be locked are frequently required ; it is generally undesirable that cloakrooms should be used as " cut-offs " or lobbies to lavatories.

Adequate means of heating to dry damp clothes are needed in cloakrooms, but care should be taken in the placing of heaters to avoid damage to clothing and especially to boots. Heating of the clothes rails themselves should be avoided. Heaters should be controlled at comparatively low temperatures. The drying of wet clothing will be discussed later in this section. Floors should be of impervious materials such as asphalt, granolithic or tiles, and walls should have a smooth, hard surface to facilitate cleaning and washing down ; the impervious wall finish must be at least 6 ft high in all cloakrooms except in Nursery Schools and a somewhat greater height is desirable. Cloakrooms attached to classrooms will also be discussed in conjunction with the placing of lavatories later in this series, together with details of planning and equipment.

A type of cloakroom which seems to be widely used in other countries but not to any degree here, is formed by widening the corridors near main entrances or at other convenient points for groups or single classes, as illustrated in Figure 22. The main objection, specially applicable to this country, to cloakrooms in this position, is the difficulty of preventing the smell of damp clothing from penetrating the whole school and very special and even costly mechanical ventilation may be necessary.

Figure 22 shows two types of corridor cloakroom arrangements. The corridor must still be the 6 ft minimum width, and the projection or additional width of the cloak space is dependant on the numbers to be accommodated. By the use of shallow recesses this method may be used to provide a continuous coat-stand sufficient only for each classroom.

All cloakroom fittings should be of types giving through ventilation and easy cleaning. The spacing and types of fitting vary only slightly with the type of school, except for Nursery Schools. Fittings may be of wood or

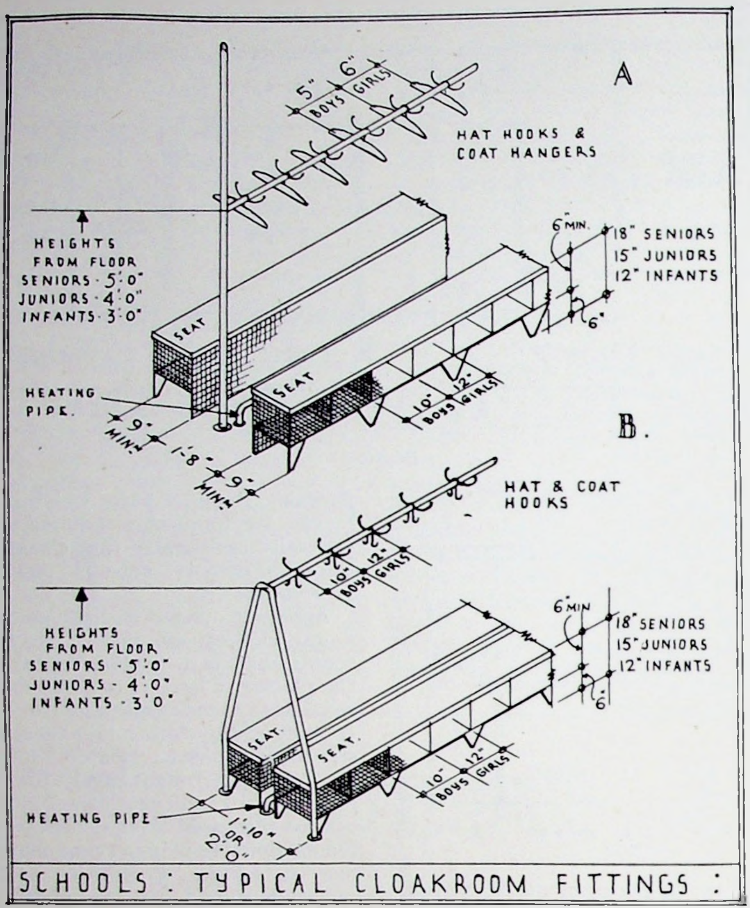


Figure 23

of metal, but the latter material is now more generally used in the form of tubing and strong wire mesh ; the seats over shoe-lockers are, however, generally of wood. All fittings, except for a minimum number of supports, should be kept clear of the floor, to permit the latter to be washed easily. All hooks should be numbered for ease of allotment to pupils. Shoe or boot cages with seat tops are essential as an encouragement to the changing of shoes during school hours, more particularly for younger children and those coming from longer distances, as wet feet are the cause of many ailments.

Pegs are more generally supplied for hats but racks or, even better, open-sided cages are more satisfactory and more hygienic in order to prevent clothes touching one another. Hooks are usually provided for coats, but coat-hangers are to be preferred, as they ensure better separation of damp clothes and clothes are less damaged when hung on shaped hangers. It appears, however, more difficult to plan for the use of hangers when economy of floor space is a major consideration.

Cloakrooms in Nursery Schools—The cloakroom should be adjacent to or adjoining the nursery hall, but it must be a separate room ; it is advantageous if the cloakroom is also planned near the garden play-space. As in all schools, each pupil must have a separate peg or hanger for clothes ; these are sometimes separated by wood or metal partitions forming shallow recesses. Instead of numbers being given to the pegs, pictorial signs are often used for the youngest children. Pegs should be from 30 to 36 in from the floor, and should be 12 in apart. It is usual to insist on the changing of boots and shoes, and a shoe-cage should therefore be provided for each child ; the latter should be large enough to receive a child's rubber Wellington boots. Owing to the low level at which the pegs have to be fixed, the seats and shoe-cages are sometimes placed separately. Floors must be finished with easily cleaned impervious materials and the walls should be treated in a similar manner to a height of at last 5 ft above the floor level.

Cloakrooms in Primary, Secondary and Special Schools—Gangways should be at least 5 ft wide between the clothes stands or between walls and stands. Hat and coat hooks should be provided in not more than two tiers, with the hooks in each row staggered, but no length is saved by this double row arrangement, as the horizontal distance between two adjoining pegs must be at least 10 in for boys and 12 in for girls ; the only advantage is that provision is made for varying heights of children.

Figure 23 shows two typical cloakroom fittings, together with the main dimensions desirable for the different types of school. For Secondary Schools a hook height of 5 ft is needed and for Primary Schools 4 ft ; if a second and lower level is provided it should be not more than 12 in below the higher rail. Infants' departments need a rail height of 3 ft or 3 ft 6 in. A centre support fixed to the floor and the ceiling, similar to that shown in Type A, is often used instead of the double support with only floor fixing shown in Type B and wire mesh is sometimes fixed between the supports to separate the clothes, but there seems little in favour of this additional cost, as it is difficult to clean. Shoe-cages generally follow the same spacing as the hat and coat hooks, namely, 10 in for boys and 12 in for girls and their height should be at least 6 in, increasing to 8 in for older children ; there should be a minimum clearance of 6 in under the shoe-cages for easy cleaning of the floor. In some schemes the seats with the cages attached are hinged to the main supports so that they can be lifted to assist cleaning. Seat heights should be 12 in for infants, 15 in for other primary pupils, and 18 in for secondary schools. Seats should be at least 9 in wide and preferably 11 or 12 in for senior boys in secondary schools, to permit of deeper cages for larger-sized shoes. Diagram A is based on the use of coat-hangers, and as the coats would cover too much of the seat it is necessary to leave a space of 1 ft 8 in between the seats ; the scheme shown has the hangers placed 5 in apart for boys and 6 in for girls, as clothes on hangers need less space to avoid contact with those adjoining. If a double-sided hat-rack is provided instead of hat-pegs, each child still has the full width of 10 or 12 in. The main objection to the use of hangers is that it requires an overall width of 3 ft 2 in compared with 1 ft 10 in necessary for that shown in Diagram B. When hat-pegs are used it is general to provide a much greater projection for the use of girls than for boys.

Individual clothes lockers are seldom used in school cloakrooms, except for technical schools and for evening classes ; individual lockers for clothing involve a high initial cost, but they have the advantage of providing storage for both clothes and books so that special book-lockers may be eliminated. Clothes lockers are generally of metal and should be adequately ventilated. Cloakrooms attached to classrooms as those suggested in Figure 22, Diagram B, need a width of not more than 9 ft. Collapsible gates or wire-panelled doors allow ventilation to the corridor and proper cross-ventilation. It is suggested that book-lockers may be placed in the centre of the cloakroom compartments.

Drying-Rooms — Drying-rooms in which wet clothing may be dried are essential in all schools. The amount of space needed is likely to vary considerably according to the locality of the school, but it is unlikely that pro-

vision ever needs to be made for more than about 60 per cent of the children. Drying-rooms present some problems, as the time available for drying clothes may be limited to about three hours ; as, however, children from long distances are probably those who remain for lunch, a longer period is usually available. Excessive temperature should be avoided as it is detrimental to clothing. Any efficient system will need a considerable amount of heat and almost certainly mechanical ventilation. Since the drying-room may be needed in summer-time when school heating, other than that for domestic hot-water, is not in use, it is better to rely on methods giving intermittent facilities ; gas and electricity, when fuel costs permit, should be considered.

Various systems of handling wet clothing have been tried in schools and factories ; many depend, basically, on movable "horses" or similar devices, from which the clothing is suspended. Figure 24 illustrates a typical lay-out, using movable "horses" arranged between heating units ; coat-hangers are fixed to the "horses," in one or two tiers, according to the ages of the children. A simpler arrangement is to provide fixed rails on which fixed coat-hangers are spaced about 6 in apart, under which are placed heating coils or rails ; these coat rails may be about 5 ft apart giving 3 ft 4 in for gangways and 1 ft 8 in for the clothes racks ; end gangways should be about 5 ft wide. It is also desirable to have a number of projecting pegs fixed on the walls on which boots may be suspended upside-down.

The drying-room should adjoin or be entered from the general cloakroom, to avoid unnecessary movement of clothing about the building.

Lavatories—The Building Regulations stress the necessity of providing adequate lavatory accommodation ; over a period of years there has been a gradual raising of the standard of accommodation, and emphasis is increasingly laid on the need to instil ideas of personal hygiene at the earliest age and to continue this training throughout the whole school period. One somewhat controversial matter is involved which affects very closely the planning of lavatories, namely, the method of providing towels. The Regulations stress the need for a "generous supply of towels" with "adequate space for hanging, storing and drying towels," and continues by "advocating an individual towel for each child and separate pegs on which they can be hung." There is a further suggestion that towels should not "hang flush with the wall," which would appear to indicate a disapproval of "roller" towels such as are now generally used. To provide pegs for individual towels in such a manner that they do not touch would appear to need a room having a floor area many times greater than has previously been contemplated, as each towel requires some 9 in of wall or rack space ; such an ideal provision, though usual in nursery schools, seems unlikely to be immediately achieved in all primary and secondary schools.

The placing and planning of lavatories varies somewhat in different schools and according to the ages of the pupils.

Lavatories in Nursery Schools—Unlike other types of schools lavatories and W.C.s are usually placed in the same apartment, and even for the youngest children they may be combined with cloakrooms and the whole separated from the requirements of any other children in the same school. It is essential that lavatories are ample in area to allow free movement and supervision ; the latter needs to be more constant than for more senior pupils. The lavatory should adjoin the nursery room. Ample and properly arranged lighting, both natural and artificial, are most important, in addition to good cross-ventilation. Basins must be provided at the rate of one for every five children under five years, and one for every eight children over five years. The heights at which basins should be fixed are 18 in for the youngest children and 20 and 22 in for the older children. Basins should be about 12 in back to front and 18 in long, with the taps placed at the sides so as to be within the short reach of the pupils of these ages. Hot and cold water are essential or, even better, warm water at a controlled temperature not exceeding 140° F. The basins may be arranged in the centre of the room or against the outer walls ; the former position is probably to be preferred, although more costly in plumbing, but it leaves the walls free for towel fixtures, tooth-brush- and mug-holders, hair-brushes, etc. Movable towel-racks are sometimes provided so that they may be used externally for drying in the sun. Separate towels for each child are essential. Some authorities have, in the past, used washing-troughs instead of basins, as the former use running water, but general opinion appears to favour the use of basins as a means for better training in individual hygiene. Washing-troughs necessitate installation of mixing valves to supply warm water at controlled usable temperatures. A large Belfast-type sink for use as a bath should be provided for every 40 children under five years ; this sink should be fixed so that the underside is about 22 in from the floor.

Figure 25 illustrates a typical arrangement of a nursery school lavatory and it should be noted that as an aid to supervision the W.C.s are placed in the same room. A cupboard for the teacher's use, to contain first-aid materials and other necessities, is desirable in the lavatory. Occasionally a foot-bath is also provided ; this is generally a large Belfast sink placed on the floor with a seat on one side.

Lavatories should have the walls finished with impervious materials to a height of at least 5 ft, and preferably the full height of the room. Floors should be of hard, easily cleaned materials, which are not affected by constant wetness and frequent washing.

Whether planned as a part of the lavatories or not, the W.C.s should be indoors and near the nursery ; but if

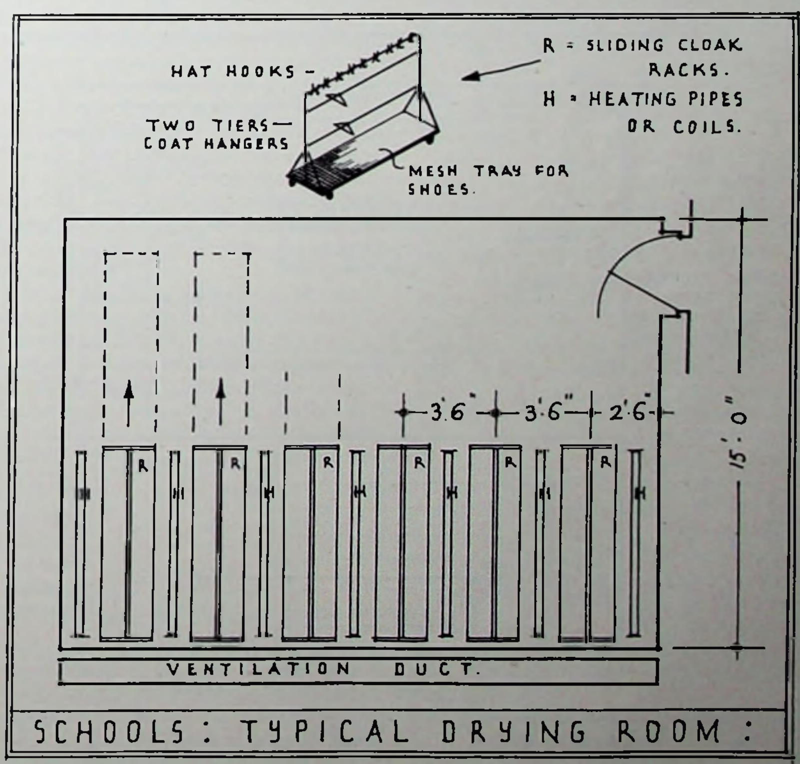


Figure 24

for any reason, other than lack of a water supply, the W.C.s have to be planned elsewhere, there should be at least one W.C. near the classroom. The closets should be provided at the rate of one for every six children under five years and one for every eight children over five years of age. The heights of closets should be suitable for the varying ages of children ; the seat heights should be 8 in for the youngest, 10 in for those about five years old, and 12 in if children are retained in nursery classes up to the age of eight years. These small closets have usually been provided with seat pads, but open fronted plastic seats are to be preferred. W.C.s should be 2 ft 6 in wide in the clear. Doors are not always provided for children under five years, although they are to be preferred ; when doors are provided they should be 3 ft high and hung 6 in clear of the floor and be without fastenings, but for children over five years doors should be 4 ft 6 in high. Partitions need not be higher than the doors, although to obtain stiffness, rigidity and simplicity of fixing the framing will need, in part at least, to be higher, especially across the doorways, to permit access for adults. Care should be taken to provide the "pull" of the flushing apparatus within reach of the children ; rapid-filling flushing-cisterns or, better, trough-type cisterns are essential.

Lavatories in Primary, Secondary and Special Schools—Lavatories may be attached to, but separate from cloakrooms and W.C.s ; if grouped with the former they should be in such positions that the cloakroom can be closed and used separately, if desired. The location is much influenced by the manner of providing towels ; towels may be provided by the children themselves in which case storage is needed either in the lavatory or in a cloakroom adjoining, or towels may be provided by the school in one of several ways ; firstly, a clean towel may be provided for each occasion one is used and then discarded for washing, which is an excellent arrangement if facilities can be provided for washingjtowels either in the school or for a group of schools ; secondly, a towel is provided for each child and then storage is again required; or thirdly, communal towels such as roller towels are provided and changed at frequent intervals. The last arrangement involves much less space, necessitates more work for the caretakers, and is less hygienic.

Hot- and cold-water supplies are essential wherever the supply of water permits. Good light and ample ventilation are essential. Basins or, if washing-troughs are used, an equivalent length and number of taps, should be provided at the rate of one for every eight children in the first hundred in a school or department, one for every ten children between 100 and 200, and one for every twelve children over 200. Basins should be 22 in long and 18 in from back to front, and fixed at heights to suit the age-groups using them ; primary schools require a height of 27 in and secondary schools the normal adult height of 32 in. Floors should be of impervious materials, such as asphalt tiles, ceramic tiles or granolithic, laid to fall to floor channels or gullies for easy cleaning. Similar materials should be used for wall facing to a height of at least 6 ft.

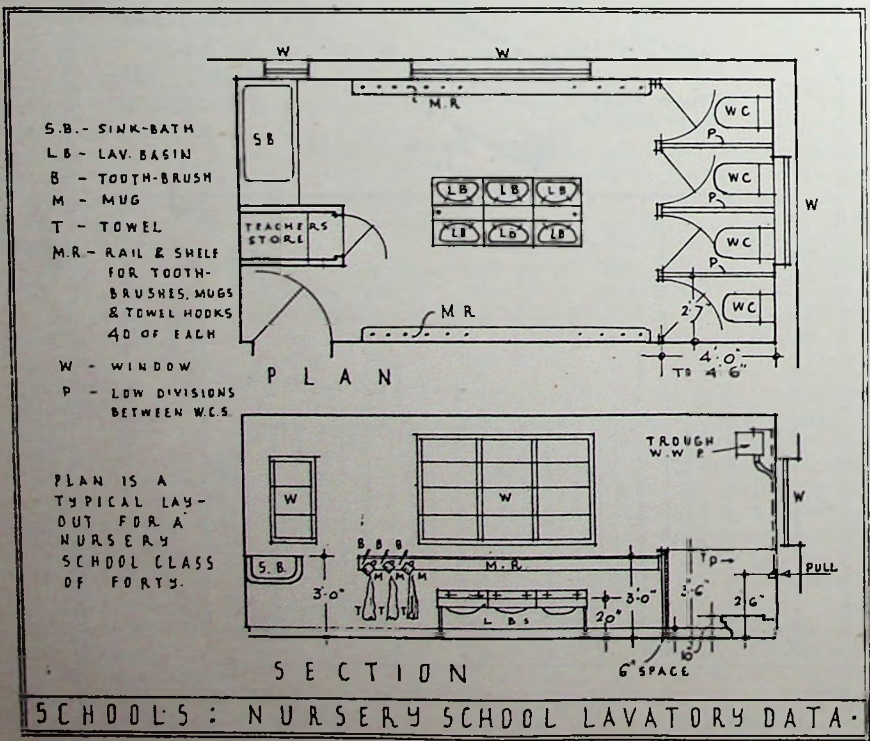


Figure 25

Figure 26 illustrates three arrangements of lavatories in conjunction with cloakrooms. Type A shows a usual lay-out in which it is possible to close the cloakroom, while still leaving the basins in use. The basins are placed in a row under the window, which allows easier drainage than that required for island basins, with towels placed on the opposite wall. A space of at least 3 ft 6 in, and preferably more should be allowed between the wall and the front of the basins. Type B illustrates an arrangement for separate basins in conjunction with separate cloakrooms for each class or pair of classrooms ; the objections to having basins in the cloakrooms of this type are not so important as when basins are placed in general cloakrooms which may be locked during school hours, thus preventing the use of the basins except at the beginning and end of sessions. If the method of attaching cloakrooms to each classroom or pair of classrooms develops in future planning, it seems possible that basins will be placed in them, particularly as the number required for each class needs but a small space, and towel storage can be incorporated with cloakroom fitments ; this scheme appears to be one of the most satisfactory from many points of view. Type C is somewhat similar to Type B, except that two separate cloakrooms share one lavatory and this may be found to be uneconomical in space-planning.

Figure 27 illustrates an arrangement of lavatories in conjunction with cloaks, in which it is easy to shut off the cloakroom without interfering with the use of the basins. By placing borrowed lights in the positions shown, both the lavatory and cloakroom may be supervised easily from the corridor. It is also a convenient arrangement when small cloakrooms are planned at intervals along corridors.

Staff Lavatories—The head teacher, and possibly the head of each department, if they are of opposite sexes, should have a private cloakroom, lavatory and W.C. near his or her room but not communicating directly with it. The remainder of the teaching staff should have separate accommodation for each sex; it should comprise a cloakroom, preferably with lockers, a lavatory and W.C.s ; these rooms should not communicate directly with staff common rooms but should be planned near them. W.C.s should have full height partitions and the following number of fittings should be provided in proportion to the staff :

Staff	Basins	Closets
3–6	2	1
6–9	2	2
10–15	3	3–4
16–25	5	5–6

Visitors' Lavatories—Lavatory provision should be made for visitors of both sexes in all schools. When the building is likely to be used for purposes other than the normal school routine it is essential that cloakrooms

and sanitary accommodation for both sexes is available in adequate proportions, and in positions convenient for the expected use, as, for example, public meetings in the assembly hall.

W.C.s—The position and number of W.C.s in Nursery Schools has already been discussed ; in other types of school separate W.C.s is the usual arrangement. Opinion varies as to the placing of W.C.s in relation to the various parts of school buildings ; they may either be part of the main buildings, near the buildings, or at a distance across a playground. A position close to or forming a part of the main buildings is growing in favour, as supervision is easier, less time is wasted, heating may be provided in winter and covered access, necessary in bad weather, is made easy. Direct access from inside the buildings is not yet generally considered desirable but if it is correctly arranged it has much in its favour ; if properly ventilated cut-off lobbies and good ventilation are planned for the sanitary apartments there seems little against the method, especially in secondary schools where large sanitary blocks may be desirable. Complete separation across a playground only appears warranted when the lack of adequate water supply does not permit the use of W.C.s. If detached blocks are used, they should certainly be provided with covered access.

Easy approach from playgrounds as well as from classrooms and cloakrooms is essential, especially for younger children. All multi-storied buildings should have sanitary accommodation on each floor level. Sufficient entrances and exits are important, as large numbers of children may need to use the accommodation within short periods, such as the morning break. Windows of teaching rooms should not overlook W.C.s. Accommodation for each sex should always have separate approaches and that for the various departments should be separated. Every part of the sanitary blocks must be well-lighted and dark corners where dirt might accumulate should be avoided. Top-light is often used as the upper parts of walls may be needed for ventilation which, however, although theoretically permanent, should be capable of control during frosty weather. Walls must be finished with impervious materials to a height of at least 6 ft and materials should be selected to provide surfaces which are easy to clean and, if possible, difficult to write on. The following number of appliances are needed :

Boys—One W.C. for every 25 up to 200 and one for every 30 boys in addition to the first 200. Minimum two W.C.s.
One urinal stall for every 10 boys up to 100 and one additional stall for every 12 boys in excess of 100, with a minimum of three stalls.

Girls—One W.C. for every 10 girls up to 100, one for every 15 girls of the second hundred and one for every 25 girls in excess of 200.

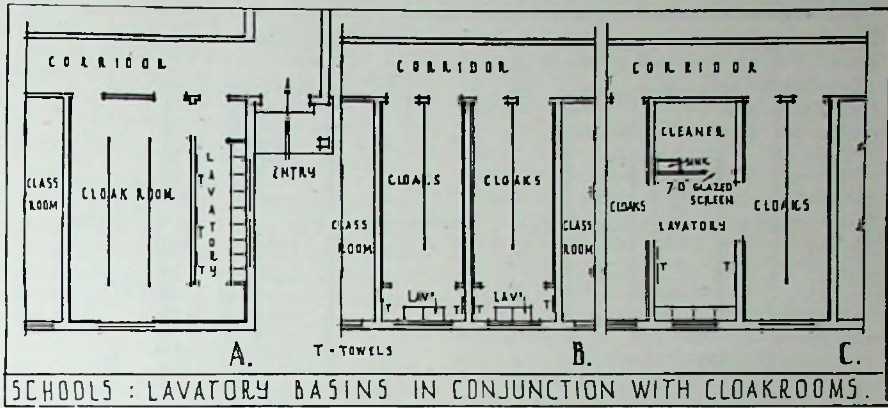


Figure 26

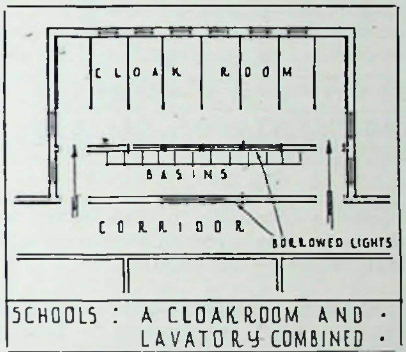


Figure 27

Urinals should be of the stall type and if slab types are used divisions should be provided ; each stall or division should be served by automatic flushing apparatus. Stalls should be planned on a basis of 21 in run per person and should be 3 ft 6 in high. Adequate entrances and exits to the urinal apartment are essential to avoid congestion. Urinals. should be in an enclosure separated from the W.C.s, although this may prove to be difficult to plan in some instances. Floors should be finished with materials such as hard asphalt or tiles and should be laid to fall to the urinal channel for easy washing down.

W.C.s should be of heights suited to the age groups of the children and the following are the heights of pans above the floor level as now in common use but some medical authorities recommend a type lower by 2 in, with 12 in as a maximum height, including those for adult use :

Age of Pupils	Height in inches
Up to 5	8 and 10
5 to 7	10
8 to 10	12
10 to 12	14
Over 12 (normal adult)	16

Pads have been widely used instead of seats but it is considered better training and more hygienic if seats are provided as should be found in the homes of the children ; plastic seats with flat undersides are hygienic and more easily cleaned. Each W.C. must have its own flushing apparatus but this is best met by the provision of trough-type flushing-cisterns which avoid the refilling time-lag involved by the use of separate flushing-cisterns. W.C. partitions must be 2 ft 6 in wide in the clear, 6 in clear of the floors and should be 6 ft 6 in high above the floor ; doors should be 6 in clear of the floor and 6 in short of the framing at the top. Partitions in tubular metal framing with metal-faced partitions are light and easy to keep clean. If partitions are not carried up to within a short distance of the ceiling, the space between the framing and the roof or ceiling should be unclimbable. Doors for all older children require fastenings and are best hung on " falling " butts so that they remain open when not in use. Thought should be given to protection of plumbing in frosty weather and it is an advantage to form a heated passage or duct behind the fittings in which all plumbing and drainage is placed, this has the added advantage that all plumbing except the " pull " is out of reach of the children and at the same time permits easy access to pipes, flushing apparatus and drains.

Figures 28 and 29 illustrate typical arrangements of sanitary offices for Primary and Secondary Schools. Figure 28 shows alternative lay-outs for sanitary offices and lavatories for boys and girls in positions adjoining main cloakrooms ; these examples show one large sanitary apartment and, therefore, are probably more suitable for Secondary Schools. The actual entrances are in each example directly from the open-air but under covered ways connecting the school buildings and cloakrooms to gymnasium blocks, at the same time the covered ways give access to the playgrounds. The two diagrams show slight variation in the detail arrangement of approaches and also entrances to the W.C.s ; the separation of the boys' urinals and W.C.s should be noted and also the use of accessible ventilation and drainage ducts behind the W.C fittings.

Figure 29, illustrates typical sanitary blocks approached through ventilated lobbies from the main school corridors ; this type of lay-out is

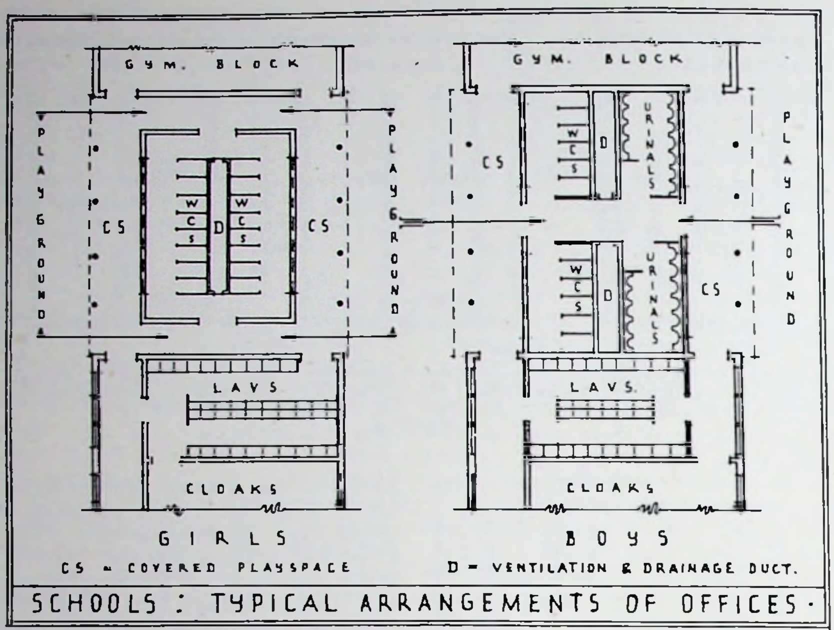


Figure 28

specially applicable to the smaller dispersed sanitary blocks desirable in Primary Schools. It should be noted that in these examples the fittings are placed on the external walls and consequently more fittings may be arranged in a similar floor area than in the lay-outs shown in Figure 28.

Lavatories and W.C.s should be provided for caretaker, kitchen staff and in large schools for the engineer, unless any of these various employees have residential quarters near or attached to the building.

It is quite usual to provide drinking fountains in lavatories, in addition to any that may be placed in the playgrounds.

Caretaker's Cupboards—A slop sink and hot- and cold-water taps at a height convenient for filling pails are required for the use of cleaners, together with suitable storage cupboards for brooms, pails and general supplies. The sinks are frequently placed in the lavatories, but are better if placed in a small cleaner's cupboard with proper ventilation ; a window is desirable and for convenience in arranging plumbing services cleaner's facilities should be planned adjacent to sanitary blocks. Large schools should have a number of cleaner's cupboards suitably placed in relation to the various parts of the school, and should have a main store for bulk storage of materials and cleaner's general supplies.

On Figure 26 a possible arrangement for the cleaner's cupboard is shown ; it is formed by placing a glazed screen 7 ft high across what might otherwise be wasted space in the lavatory ; the space between the top of the screen and the ceiling should be made unclimbable. Figure 28 illustrates other typical positions for cleaner's cupboards placed in sanitary blocks.

Adequate ashpits, dustbins and garbage bins must be provided in positions accessible to vehicles but at the same time screened from view and inaccessible to the children.

Heating Chamber—The heating chamber must be carefully ventilated and access to it must be cut-off so that pupils cannot enter the room ; it is preferable that access be arranged externally to overcome any risk of penetration of fumes into the school buildings. Fuel storage must be adequate in size for the supplies to be delivered in large quantities, and for this purpose convenience to roadways for easy delivery is of the utmost importance. Fuel storage should be properly arranged in relation to boilers to reduce handling of fuel to a minimum. Care should also be taken to ensure that the boiler room is of a sufficient area and height to avoid difficulties in plant lay-out.

Meters—Proper provisions must be made for gas and electric meters, distribution boards, fuse boxes and similar apparatus in positions convenient to the entrance of supplies and for easy distribution ; they should be so placed as to be accessible only to the caretaker or his staff.

Classroom Furniture—All classrooms necessarily must be based on the amount and type of furniture needed for each type of teaching and to some extent on the ages of the children in each department or school.

In respect to the numbers to be accommodated in a normal classroom the Education Act (1944) proposes a progressive reduction of numbers formerly allowed in classrooms to 40 in Primary Schools and 30 in Secondary Schools. With these numbers in mind the Regulations lay down minimum classroom areas but these will be found not to allow much surplus space for any temporary increase in class numbers if adequate-sized furniture is used and sufficient gangway space is planned.

There appears to be a growing feeling in educational circles in favour of the use of flat-topped single tables with chairs to provide seating and writing space. There does not seem to be much medical evidence in favour of providing sloping tops for desks or tables and sloping tops make the tables less adaptable for various uses. Desks with fixed seats, which have been very widely used in the past, provide a less good type of seating, less adaptable to varying sizes of children and heavier to move about the room if changes in furniture lay-out are required for different subjects. Dual tables with chairs require rather more space than dual desks but less than for single

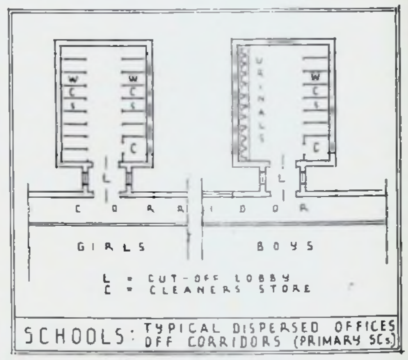


Figure 29

tables unless the latter are arranged as dual tables.

The desirable table or desk sizes are 22 in long and 18 in from back to front (minimum) for Secondary Schools and 20 in by 17 in (minimum) for Primary Schools. Larger sizes are probably desirable but it will be found difficult to accommodate increased sizes in the areas laid down in the Regulations. Dual tables or desks should be 44 and 40 in long respectively. The floor space needed for a single desk with a loose chair should be 1 ft 8 in by 3 ft for Primary Schools and 1 ft 10 in by 3 ft for Secondary Schools using the table sizes mentioned above ; but it may be found necessary to reduce this to minimum sizes of 1 ft 8 in by 2 ft 8 in for Primary Schools and 1 ft 10 in by 2 ft 10 in for Secondary Schools. Single and dual desks with fixed seats save a small amount in the back to front dimensions, but it is doubtful if this is wise. Desks may have locker tops, a shelf under or plain tops only ; the last two types must therefore be accompanied by lockers in some part of the building, as already discussed. The heights of seats and desks are of the utmost importance in the provision of correct working conditions, a factor that has had insufficient attention in many schools in the past. Figure 30 is an attempt to summarise the many recommendations available on this subject and to draw a reasonable average in relation to age groups of children ; in application it is usually necessary to provide a proportion of chairs and desks of sizes for the ages

above and below any selected group; this proportion is likely to be about 25 per cent of a class above and below the selected group, leaving only 50 per cent of the size for the age group concerned. The selection of seat and writing surface heights should be based on providing for the feet to be flat on the floor, with the lower part of the leg vertical and the upper part horizontal, the back upright, with support in the small of the back and just below the shoulders. The edge of the writing surface can be almost directly over the front edge of the seat. All furniture should be movable and consequently not too heavy, which is an objection to types having locker-tops.

Furniture for Nursery Schools is often of a light nesting type suitable for movement by very young children. For children in senior classes, such as the sixth form of Secondary Schools, it is desirable to provide tables of larger sizes, such as 30 in or even 36 in long per person by 24 in or 27 in wide or, alternatively, to use dual tables for only one pupil. Gangways between tables or desks should not be less than 16 in wide and are better if at least 18 in wide for easy access for pupils or teachers. Also, desks should not be placed nearer than 6 in to side and back walls or 12 in from external window walls or obstructions such as radiators when these spaces are not used as gangways. Desks should not be nearer than 7 ft to the blackboard, nor more than 30 ft away; clear vision of the blackboard influences the plan shape adopted for the arrangement of the furniture and ultimately the room itself. Very wide rooms provide less satisfactory vision from the end front seats than if narrower and consequently longer rooms are used. Also, daylighting is likely to be better in narrower rooms. The space allowed for the teacher's desk from the front row of desks to the blackboard should not be less than 7 ft and is better if 8 ft. It is no longer usual to place the teacher's desk on a platform in normal classrooms. The tables should be planned to provide left-hand light for all pupils. Figure 31 illustrates the basic spacing for classrooms, as discussed above. Diagram A shows the requirements for Primary Schools and Diagram B those for Secondary Schools. The Figure is equally applicable to the use of tables and separate chairs or for desks with attached seats.

Classrooms—The Ministry of Education's Regulations set out clearly the floor areas for all types of classroom. Classrooms must not be passage rooms from one part of the building to another nor must they accommodate more than one class of children. Lighting of classrooms is most important and it should be noted that the Regulations require the provision of a daylight factor of two per cent minimum on all desk writing-surfaces; this requirement has very considerable bearing on plan and sectional shapes adopted for the rooms; it also influences the design of windows, top-lights and borrowed lights between classrooms and corridors, as will be discussed later in this series.

Primary-school Classrooms—The areas of Primary-school classrooms are required to be at least 520 sq. ft. for 40 children, and when "general-purpose rooms" are not provided the minimum areas have to be increased to 600 sq. ft. The Regulations do, however, provide for certain exceptions in some small schools which have less than "one-form entry." Windows must be such as to provide the minimum daylight factor, and should have a low glass line of not more than 3 ft, which may need to be reduced for those rooms to be used by infant classes under eight years.

Opinions vary as to the shape of classrooms to provide the required 520 sq. ft. areas; some designers favour a narrow but long room about 18 ft wide by some 29 or 30 ft long, claiming that the lighting from the side windows must be better than when wider rooms are used; other designers prefer a shorter but wider plan which by various types of section may be equally well lighted and thus save length of external wall, corridor and generally make for rather more compact planning of the school buildings as a whole.

Figure 32 illustrates two primary-school classroom plans which generally

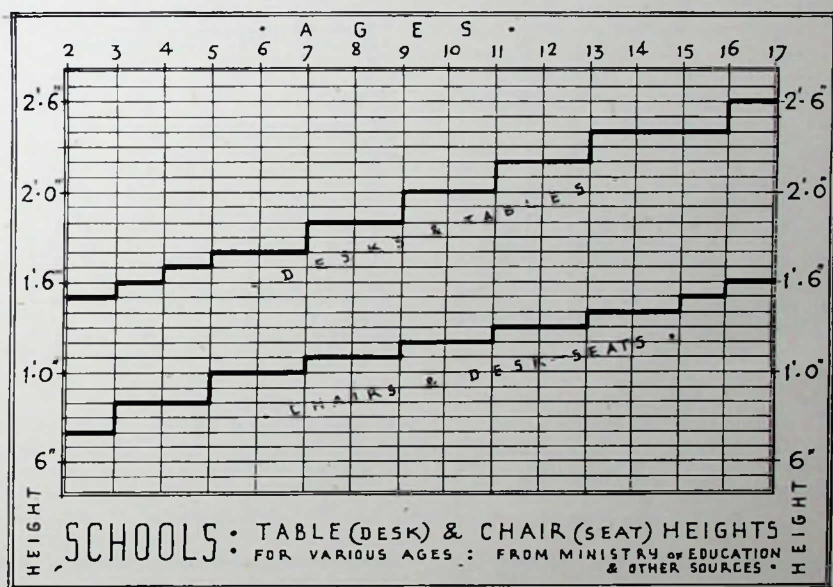


Figure 30

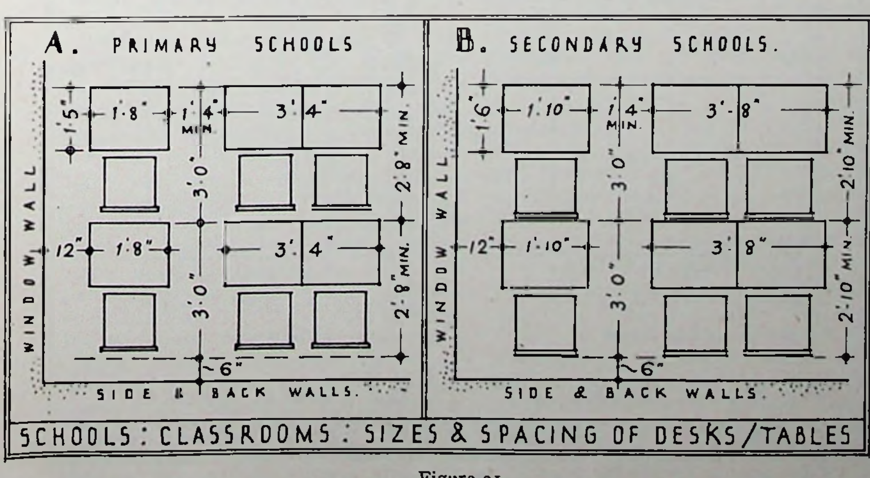


Figure 31

are based on the dimensions recommended in Figure 31. Diagram A shows single desks placed 1 ft 4 in apart and the minimum space of 7 ft for the teacher, while Diagram B shows dual seating and tables and a teacher's space of 9 ft, which is rather generous. Both diagrams are based on an approximate area of 520 sq. ft. A third type of seating lay-out is one which is basically similar to the dual table arrangement, but single tables are used placed 6 in apart, but still retaining the same gangway widths of 16 in.

It will be appreciated that very many variations of lay-out are possible within the given floor area and therefore only typical examples are shown; if Diagram A is taken as a basis, but the front row of desks taken away, thus

reducing the length to 22 ft and another side row added, making the width of the room up to 23 ft 8 in, a very different shape results, but the area remains 520 sq. ft. A similar change, however, to Diagram B would make a room too wide to be lighted adequately except possibly with top lights.

Secondary School Classrooms—The Regulations require a minimum floor area for classrooms of 480 sq. ft. on the basis of accommodating 30 pupils; some classrooms for special subjects have, however, to be 720 or 900 sq. ft. The Second Schedule of the Regulations sets out clearly the number and sizes of the rooms for varying sizes and types of school.

Figure 33 illustrates two typical classroom lay-outs based on the furniture dimensions shown in Figure 31 (See page 97). Diagram A is based on the use of single tables and chairs or single desks, and Diagram B on dual desks or tables. Since both Diagrams show rooms of the same dimensions, it should be noted that Type A can only just be accommodated in the 480 sq. ft. area and no space is available for lockers on the side wall, if these are required, as shown in Type B. If, however, the gangways shown in Type A between the desks are reduced to a dimension below that desirable (to 1 ft 4 in or 1 ft 5 in) the width of the room may be reduced to 20 ft. and the length may be increased to 24 ft. which allows the desirable 8 ft space at the blackboard end of the room. A similar reduction of gangway width (to about 1 ft 6 in) in Type B permits a similar teacher's space; such a reduced width may be advantageous and provide better lighting. Single tables or desks are definitely to be preferred for all pupils and are really essential for all older pupils, especially if they remain to the age of 17 or 18 years; in such schools, where pupils stay to the sixth form stage, "division study rooms" for small groups of pupils are desirable; these should be based on accommodation for 15 to 20 pupils, each having an area of at least 16 sq. ft. per pupil.

Heights of Classrooms—The Regulations do not specify minimum heights of rooms, but require various factors to be met which in turn control room heights; of these factors the most important is the provision of a minimum daylight factor of at least 2 per cent on working surfaces; the other factors influencing the height are the width of the room and purpose to which it is to be put. The Memorandum accompanying the Regulations does, however, suggest that teaching rooms should not be less than 11 ft to the ceiling. Greater heights are, in most situations, unnecessary if the necessary lighting requirements are met. Flat ceilings are generally desirable, but it may be more convenient with some types of construction to provide ceilings at tie-beam or collar level and, if the necessary height is available, to design partial roof or clerestory lighting. Again, it may be possible to start the ceiling at 10 ft above the floor (wall plate height), rising to 12 or 13 ft at collar level, so long as the flat ceiling is at least 50 per cent of the room area. It is doubtful under ordinary conditions, when lighting is from one side only, if rooms 11 ft high (with windows reaching to the ceiling) can light adequately across a width of more than 20 ft from the window wall. Clerestory lighting alone, on the side opposite the main windows, without borrowed light between the classroom and the corridor, does not greatly assist general lighting of classrooms; especially does this apply to the row of desks nearest the corridor wall; it is this part of the room that provides the greatest difficulty in respect to meeting the requirements of a minimum daylight factor.

Rooms should not be open to the ridge; flat ceilings under pitched roofs insulate rooms more effectively against outside temperature changes and assist generally the provision of more comfortable conditions. Windows must not be so placed that they are directly in front of the pupils and they must be so placed that the lighting is as even as possible over the whole area of the room.

Classroom and Corridor Sections—The widths and heights of classrooms have already been discusssed in general but the placing of windows and the sectional shape adopted have a material effect on room shapes and lighting. Corridor widths have also been discussed, together with the question of corridor lockers, but again not in relation to the section of the building as a whole. Corridors should be not less than 8 ft in height and in order to obtain direct cross-ventilation to classrooms over corridor roofs greater heights are often inconvenient. Ample window area is essential in corridors, a large

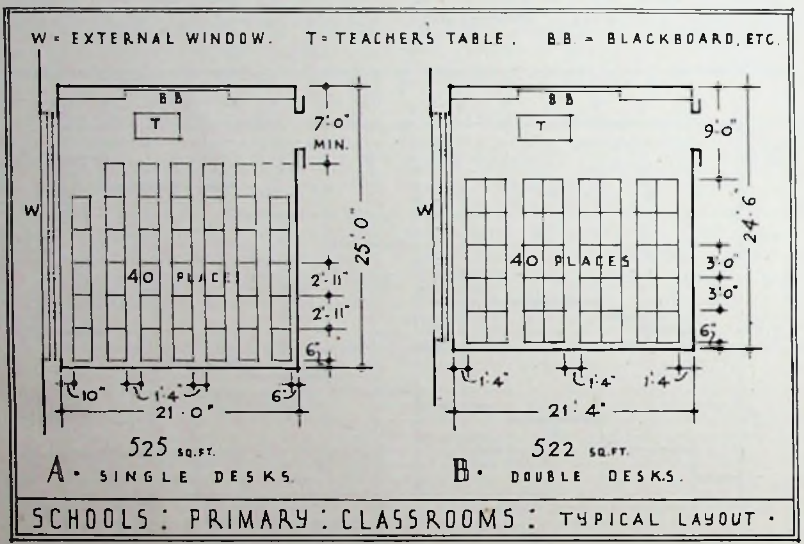


Figure 32

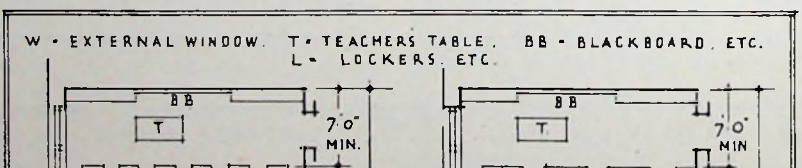


Figure 33

part of which should open, more especially if the classrooms obtain cross ventilation from them; such an arrangement is apt to be disturbing to classes, due to corridor noise. Opinions as to whether glazed lights between classrooms and corridors is disturbing to the pupils varies; many teachers maintain the view that after a few days the pupils take no notice of passers-by.

Figures 34, 35 and 36 show sections through classrooms and corridors. Figure 34 A, B and C, and Figure 36 show single-story types, and Figure 34 D and Figure 35 show multi-story types. It is generally desirable that direct ventilation is available to classrooms over the corridor as shown in all figures except 34 D. Borrowed lights between classrooms and corridors are widely used and assist the lighting of wide types of classroom; an objection to the use of such lights is that the main light on desks nearest to the corridor is likely to be from the right-hand side and other rows may receive light of equal strength from two directions. Another objection to large borrowed lights is that the wall-space may be wanted for the accommodation of lockers, display boards or bookshelves.

Where rooms are planned on both sides of corridors, as in Figure 34 C, the corridor must be top-lighted and, in consequence, may not be well ventilated; opening clerestory lights for the classrooms above corridors of this type are, therefore, most essential.

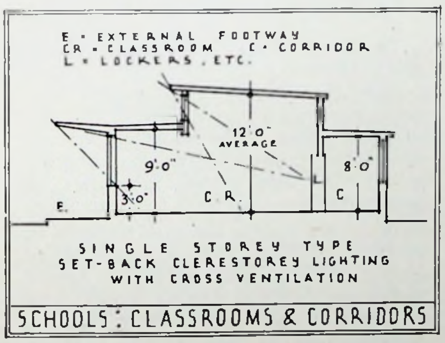


Figure 36

Classrooms with partial top- or roof-lighting are not generally favoured; they usually cause cold down-draughts which are difficult to overcome; also, the cost of maintenance of roof-lights, especially cleaning, is high. Vertical lights as shown in Figure 36 are more easily maintained. When borrowed light across corridors is used sill heights must be kept low to avoid shadows across desk-tops nearest to them and also because the angle of light is necessarily low from the upper part of corridor windows. Figure 34 A shows a normal pitched roof over the classroom and a flat roof over the corridor, above which clerestory ventilation is provided for the classroom. Type B shows dormered windows for a similar purpose, but light from these, although

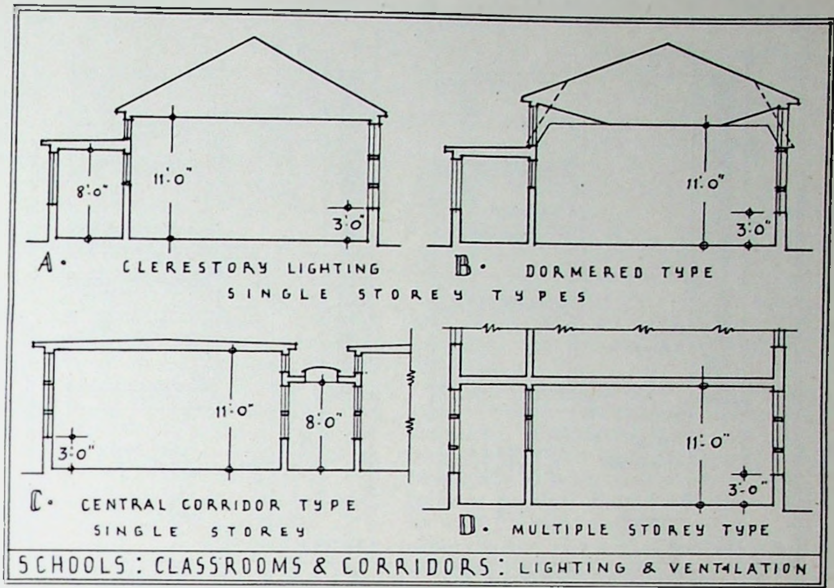


Figure 34

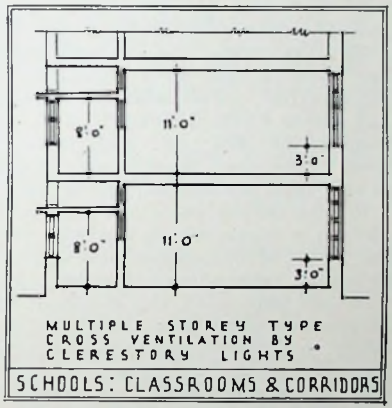


Figure 35

thrown well back into the room, may prove to be uneven on the desks as a whole. Type C is not very satisfactory as the movement of air is likely to be sluggish in the small area between the two main roofs. Type D is the most common of the sections used for multi-story buildings; the topmost borrowed lights are usually made to open to provide ventilation between classrooms and corridors. All the lower lights between classrooms and corridors and all such lights when clerestory ventilation is provided, are usually fixed to avoid dangerous obstructions on either corridor or classroom side. Figure 35 illustrates an alternative method of dealing with multi-story buildings to overcome the difficulty of having to ventilate the classrooms through the corridor. It is based on the cantilevering out of the corridor at each level and roofing them at about 8 ft high. The ventilation would be much more satisfactory but the cost is probably rather high, though this objection may be lessened by the introduction of piers as supports in order to avoid expensive cantilever construction.

Figure 36 shows a type of section, suitable only for single-storied buildings which is specially designed to give even lighting over the whole of the room without dependence on borrowed lights; ventilation is arranged over the corridor roof; this type of section permits the use of corridor walls for lockers, etc., up to any height within reach of pupils. It should be noted that external cantilevered canopies are introduced to reduce sky-glare from the main windows, which is frequently trying to the eyes if rooms having windows of large areas are used. Reference should be made to the Ministry of Works Post-War Building Studies, Report No. 12, "Lighting of Buildings," in which this subject is discussed in great detail with diagrams of light intensities resulting from the use of varying sections for classrooms. From the point of view of good ventilation it is desirable that the heads of all windows are placed as near to the ceiling as construction will permit.

Classroom Windows—While no precise sizes are given in the Ministry of Education's Regulations or the "Memorandum," windows are controlled in area by the necessity of meeting the 2 per cent minimum daylight factor and the amount of ventilation required, which is six changes per hour; the latter is generally met by opening windows. The Regulations require one half of every window area to open and to be so constructed that the amount and direction of the incoming air may be regulated according to the direction of the wind. The windows must be so distributed as to light evenly every desk, and the Memorandum suggests that the lighting should not exceed by more than 50 per cent the intensity prescribed; it is suggested also that by the use of clerestory or top-lights, intensities up to 5 per cent may and should be secured whenever possible. The difficulty of installation and the relatively high cost of maintenance,

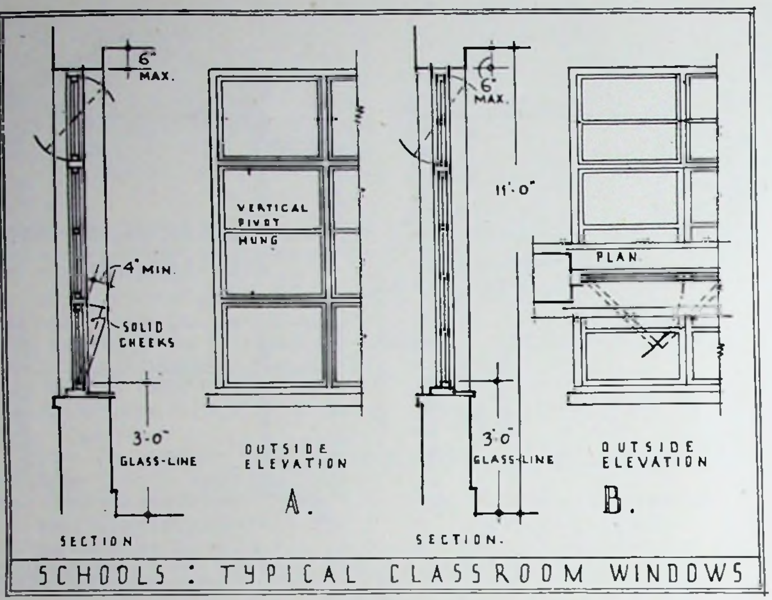


Figure 37

repairs, cleaning and heating of top-lights, should be borne in mind, and such types are limited in use to top floors or to single-story buildings. Windows should be placed at such a level that the pupils can see out when seated, which may be taken as 3 ft from floor to glass-line, except in Nursery Schools, where a still lower level is desirable. Windows should be so planned that the glass-line of the window farthest from the teacher is on a level with the back of the last row of desks. Heavy mullions or piers are undesirable owing to contrasts of light and dark surfaces. Windows should always be on the left-hand side of pupils if on one side only and if on two sides the strongest light should be from the left side, although the latter may be difficult to achieve if borrowed light from corridors is used, as already noted. Windows should not face either teacher or pupils. Windows should extend as near to the ceiling as is practicable to permit a maximum penetration of light to the far side of the room and also to ventilate the top of the room. Elaborate or expensive fittings or gear for the control of windows should be avoided. Clear glass should be used both in external windows and borrowed lights.

Types of Classroom Windows—Many types of window have been used for classrooms, of which the most usual are those having a hopper light at the bottom and either a vertical pivot-hung and a horizontal pivot-hung light or two or more horizontal pivot-hung lights above. Another common type is a double-hung sash, with a pivot-hung light over. Figure 37, Diagram A, shows a hopper light at the bottom, a vertical pivot-hung portion equal to about half the height of the window and a horizontal pivot-hung light at the top; the central light in this diagram is often replaced by horizontal pivot-hung lights. Double-hung sashes have the fault of not opening more than about half the total area; pivot-hung types with the hopper below are, perhaps, the most satisfactory; incoming air enters near the bottom and can be directed upwards, and the whole of the upper part can be made to open. Hoppers, when used, should have a clear air opening at the top of 4 in and should have side cheeks to direct the incoming air upwards over the heads of the pupils, also the top of hopper lights should be at least 4 ft 6 in, and better 5 ft above floor level. Hoppers should not be used for upper lights, as the incoming air strikes the ceiling and causes down draughts. The uppermost lights must open to the full extent for ventilation purposes. Pivot-hung sashes may be opened in wet weather with less risk of rain entering the room than with double-hung sashes and permit maximum opening in hot weather.

The sliding and folding type of window with pivot-hung sashes above, shown in Figure 37, Diagram B, has been widely used; it can be opened to the fullest extent; in addition, it has most of the advantages of casements, as it is possible to open a leaf against a side wind from any direction; it has not the disadvantage of opening to the floor and thus cooling the lower part of the room excessively. Full-length sliding and folding windows and similar windows or doors are often installed in Nursery Schools and in infant departments, but it is probably better to insert a pair of doors in a large window area, since by this means better control of the incoming air and especially floor draughts is possible. Doors are often installed about one or even two steps above the floor level to overcome floor draughts and also to permit heating pipe runs without the cost and trouble of sinking these below the floor level. An objection to any form of window reaching to the floor is that heating pipes and radiators have to pass across them. Doors and full-length windows do, however, permit very low glass lines, which are desirable for small children.

Borrowed lights between classrooms and corridors are usually fixed except when ventilation from the corridor has to be provided and then the top part of the light is usually horizontally pivot-hung.

Clerestory lights or ventilators, should be of horizontally pivot-hung type.

Care should be taken when windows of the casement type are installed on the ground floor to avoid external opening projections below the height of persons. If windows overlook playgrounds, flower beds and better guard rails should be used near the buildings if the lower edges of the open sashes is less than 6 ft 6 in above ground level.

Doors to Classrooms—Doors should be at least 3 ft wide and should have the upper part glazed to permit supervision without entering the room. Frequently pairs of doors are installed, but these are held, by some authorities, to be a nuisance and even dangerous. Doors should be placed near the teacher's end of the room for proper control. Access to store-rooms attached to class-rooms, when provided, are also better if placed at the teacher's end. The use of flush doors for schools has increased in recent years; the flat surfaces are more easily cleaned, but it is important to select only those types which are solidly built and have well-protected edges, as wear and tear is heavy in school buildings.

Teacher's Wall—The wall at the teacher's end of the room has to carry certain of the teaching equipment. The equipment varies according to the use of each room. The most important piece of equipment is the chalkboard; it may be one of several types, of which the most common is a long sectional board in two, three, or even more sections, fitting into a fixed rack; lengths of 9 and 12 ft are usual. Other types are vertical boards about 4 ft or 5 ft wide, and 8 ft to 10 ft high; a development of the vertical type of board is the continuous flexible revolving type, with similar dimensions to those of the normal vertical types. Figure 38 A illustrates a typical fixed sectional chalkboard; these are usually at 3 ft 3 in or 3 ft 6 in above the floor, and are about the same height overall; the sectional boards being usually about 3 ft high. When reversible chalkboards are used they should not be too large in area or too heavy to handle easily; a width of 3 ft is probably better than the 4 ft width which has been often used. Chalkboards about 3 ft square can be adapted to suit unit fittings, as suggested in Figure 38. Diagram B on the Figure illustrates the vertical sliding chalkboard. Unit-type fittings which are interchangeable permit of varying the storage accommodation in classrooms to suit the special needs of each

class or subject ; the unit fittings illustrated in Figure 38 include cupboards, open shelving, and notice-boards. Open shelving seems rather undesirable near chalkboards owing to chalk dust, and should not be placed under the chalkboards. Cupboards and shelving are usually required in two depths of about 9 in and 14 in. Cupboards and shelving are of no value if the height exceeds 6 ft 8 in overall ; and, in fact, height over 5 ft 6 in are only of limited value.

Platforms for the teachers are not provided in normal classrooms in more recently-equipped schools.

Materials for Classrooms—Floors should be constructed of fire-resisting materials ; in the case of single-story buildings the floor finish should be laid directly on the surface concrete. The most common type of flooring is wood blocks (hardwood is not necessary) laid in mastic ; tongued and grooved boarding is also widely used, secretly nailed to fillets embedded in the concrete. Cork, linoleum, rubber and similar jointless materials have been laid directly on the concrete, but with many such materials the cost is high and the maintenance also may be high. Floor materials should be selected to be as silent as possible, easy to clean, and capable of withstanding frequent washing and hard wear arising from moving desks. Walls should be finished, at least to dado height, with materials which will stand frequent cleaning, hard knocks and rough usage, but such materials are difficult to select. Tile and brick are generally unpleasant in appearance, although hard-wearing and requiring little upkeep ; even hard plaster may need frequent painting and repairs. Plywood and leather cloth have been used with some success. The upper parts of classrooms are usually plastered and distempered ; colour-washed brickwork has also been used, although it tends to be noisy. Great care should be taken to select partition materials to avoid the passage of sound from one room to another and the planning of stores between classrooms is very helpful in reducing sound transmission.

Nursery Classrooms—Rooms with large floor areas are needed for nursery classes and are based on about 25 sq. ft. per child. A south-east aspect is especially desirable. Large windows reaching nearly to the floor should be used so that the youngest children may see out. Easy access to the garden and play space is very necessary ; this may be provided by the inclusion of pairs of doors in the windows or by the use of sliding and folding windows reaching to the floor ; whichever system is used great care should be taken to design the windows or doors so that they are draught-proof. It is not unusual to provide an open fire in addition to the usual central heating, but this provision is sometimes viewed as dangerous.

Furniture consists of small light-weight tables and chairs suited in size to the age-groups of the users : the light weight should be related to the ability of young children to move the tables from the nursery to the outdoor play space without assistance. The tables are often single tables about 20 in by 20 in, but more frequently dual tables about 20 in by 40 in are used ; it is desirable that the tables and chairs be nested.

The floor finish is of the utmost importance, as the children sit or crawl on it while playing, and consequently materials such as rubber, cork or linoleum should be used as a covering in place of the usual classroom boarded floors. Part of the wall area should be covered with a chalkboard dado on which children may draw. A number of built-in cupboards are essential in the nursery for the storage of apparatus and toys, and at least a part of this accommodation must be on a level at which it is accessible to the children.

A toy store adjoining the room or opening directly from it is desirable for large toys which cannot be kept in the cupboards in the room. A bed store is also needed for the rest beds used during afternoon rest periods ; these beds are usually of light metal frames with wood or canvas covers about 4 ft 6 in long by 2 ft wide and designed to nest. There should be direct access from nursery room to lavatory ; the latter should include the W.C.s, and adjoining the lavatory should be the children's cloakroom.

It is desirable that a kitchenette is provided in conjunction with the nursery or group of nursery rooms in which milk and water may be heated at lunch-time, and from which the midday meal may be served, as the children sometimes take the midday meal in the nurseries. This kitchenette has educational value, and by the provision of equipment such as draining boards and sinks of suitable heights and sizes the children not only do much of the work but learn to handle various types of objects under a teacher's supervision.

Figure 39 illustrates a typical nursery unit comprising playroom, lavatory, cloakroom, bed and toy stores. This unit may be repeated as frequently as is necessary. It is usual to have nursery classes not exceeding 40 and, where numbers permit, to separate the older children from the younger. A kitchenette is shown adjoining the nursery playroom, but if several nurseries are provided this does not require duplication. This kitchenette provides a sink and cooker for adult use, and other sinks and china cupboards at levels suitable for the use of the children.

Practical Rooms—This group of rooms covers a wide range of rooms for the teaching of special subjects, the requirements of which vary very

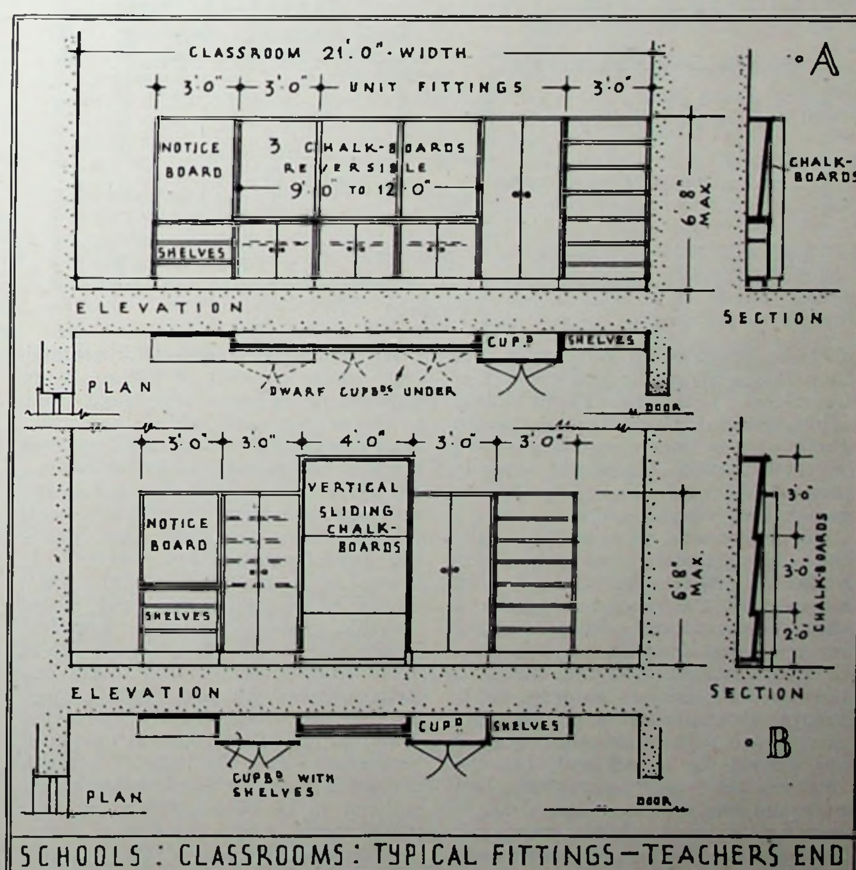


Figure 38

considerably. Much more emphasis has been placed on the provision of these special purpose rooms in recent years and due to the extension of the school age the need will be still greater in the secondary schools of the future.

In Primary Schools the rooms are called " general purpose rooms " and require a minimum floor area of 700 sq. ft. The best shape for these rooms is likely to approximate to a square, and therefore be about 25 ft by 28 ft, with the lighting on the longer wall. The rooms should have good lighting, but need not necessarily have a south-east or south aspect. The equipment should consist of movable tables and chairs, as the rooms are used for general art and craft purposes. It is desirable that two or three sinks, gas points, electric power and light plugs be provided in each room. A fixed bench along the window wall is also useful. Large store rooms should adjoin general purpose rooms (with direct access from them if possible) in which may be placed the work in progress of each class, equipment, new materials, models, etc.

For Secondary Schools the regulations give aggregate areas for practical rooms in addition to art and craft rooms, and the Second Appendix of the " Memorandum " sets out various recommended alternative distributions of this practical accommodation as between the various subjects to be taught. Four alternative groupings are given, each with alternative views on the size of the school and the sexes of the pupils ; many variations, however, are likely to be required as, for instance, in rural schools, where subjects such as dairying may be taught. The four main alternatives are, firstly, general courses, pupils age 11 to 16, secondly, general courses, pupils age 11 to 18 ; thirdly, technical courses, 11 to 16 and over ; lastly, commercial courses for pupils age 11 to 16 years and over.

The more usual subjects for which special rooms are provided cover art, crafts, handicraft, science, housecraft, wood and metal workshops, geography, book-keeping and typewriting ; in some more specialised schools other subjects have to be provided for, especially for older pupils in schools giving technical courses. It will be noted that general course schools require less specialised rooms for some subjects, such as housecraft, but more accommodation for subjects such as science ; whereas commercial and technical schools each require different distributions of the practical room space.

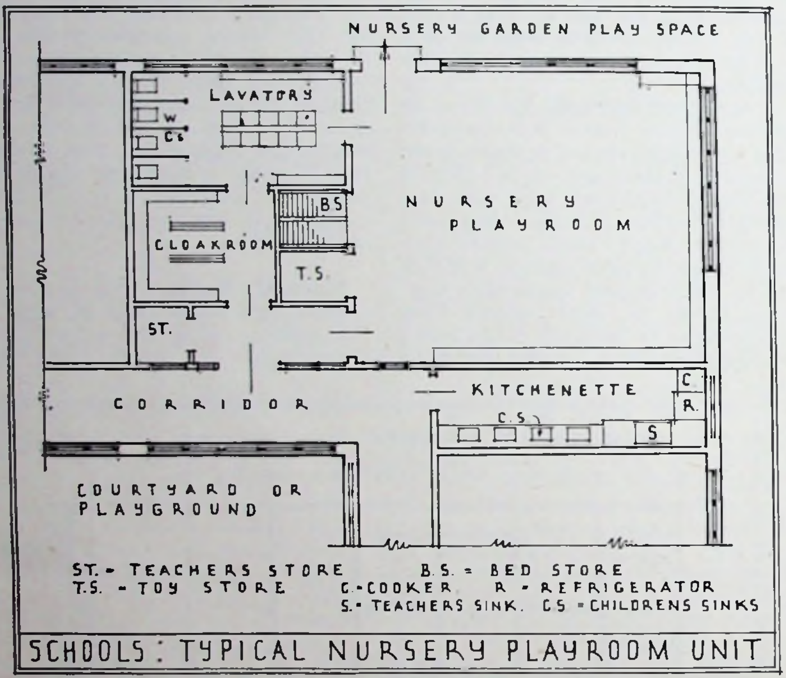


Figure 39

Art and Craft Rooms—For art and craft rooms an area of 900 sq. ft. is required in all secondary schools, and to this is frequently added one or two craft rooms of 960 ft each for general courses for pupils up to 16 years ; the subjects covered in the craft rooms are very varied and may include book craft, printing, weaving, fabric printing, model making and pottery. If several craft rooms are provided they should be grouped togther and, where possible, grouped with other practical rooms ; in larger schools one room is likely to be devoted mainly to drawing and becomes an art room proper, leaving the others mainly for crafts. The lighting of art rooms is of special importance and the light of a north aspect is desirable, but it is often considered to be of less importance for craft rooms, where light from sunny aspects is advantageous ; the provision of north light dictates to some extent the position of the rooms in any plan. Proper lighting in art rooms is essential to procure effect sof light and shade on objects to be drawn ; cross or confused lighting with windows on several walls should be avoided, except small high-level windows introduced for purposes of cross-ventilation. Art rooms are often approximately square in shape as shown in Figure 40A, but longer and narrower rooms as shown in Figure 40B, although disliked by some authorities, have the advantage that two or more separate groups can work round different subjects at the same time. Craft rooms are better if shaped as shown in Figure 40B. Widths of 24 ft or more require ceiling heights over 11 ft to provide adequate side-lighting, unless toplights are provided in addition.

In the square type of room, one large window with bars, mullions, etc., reduced to the minimum required for structural safety, is the most satisfactory, or if several windows are used they should be grouped close together. The windows should extend to the ceiling and even have some top north light and should have a sill level of 5 or 6 ft above the floor ; windows should be fitted with blinds drawing up from the bottom, or curtains, so that the light may be easily adjusted. It is also necessary in craft rooms that the windows can be darkened when a lantern or an epidiascope is used. A large demonstration blackboard, preferably of a material into which drawing pins may be fixed, should be placed on the wall opposite the pupils when seated, with the main light on their left hand ; wall space should not be broken up more than is necessary in order to provide maximum space for displaying objects, pictures and drawings. One or two sinks with water laid on and draining boards are needed in a convenient position ; these sinks may be placed in a bench fitted under the window. Sinks are also planned in storerooms in some schemes, but in such a position there is a greater risk of damage by splashing and supervision is more difficult. Wall benches should have drawers and cupboard space below, and the widths should be based on the storage of drawings, and drawing paper of the sizes likely to be used in the room. Racks for water pots should be provided, and if clay modelling is to be part of the training a portion of the floor should be tiled ; sometimes a separate room is provided for modelling in clay and for pottery work. This is specially convenient when a kiln is installed. If a separate modelling room is provided the floor should be tiled or finished with other impervious materials. Floors of art and craft rooms are best of wood which is less damaged and damaging if tools are dropped.

Furniture should consist of light trestles and chairs or box stools for drawing ; table tops to be laid on the trestles for craft or other work should be provided. Alternatively, single flat-topped tables about 24 in by 18 in may be used and can be made adaptable

for both art and craft work, especially if covered with linoleum or hardboard, which are easily renewable. Loose bolcks of wood are used for tilting drawing boards on flat-topped tables. One or two strong tables, about 6 ft by 3 ft, should be provided. A glass-fronted store and display fitting containing drawers for imperial-sized paper and other materials is required. The top of this fitting and that of window benches should be available for craft work and heights should, therefore, be suitable. A strip of wood 2 in or 3 in wide, fixed flush with the wall plaster, about 18 in or 2 ft above the dado, is useful for pinning up drawings and also a continuous narrow shelf 6 in wide with a raised edge placed 3 ft above floor level.

A storeroom should be attached and have direct communication with the art room. It should be about 150 sq. ft. in area and be fitted with shelves for the storage of casts, some of which may be at least 18 in wide. Shelves must be strongly constructed as the weights to be carried may be heavy. Other equipment is needed for the storage of drawing boards in vertical racks, and cupboards for general storage of small objects. Special consideration must be given to the artificial lighting of art rooms, and the most satisfactory general arrangement seems to be by means of one powerful lamp placed in such a position as to bring the source of light as nearly to the position of that provided by the windows in daytime. An alternative method is to provide small shaded local lights over the drawing boards, with a powerful movable and adjustable lamp which can be directed on the object to be drawn. Good overall general lighting is required for the rooms to be used for craft purposes.

Geography Room—In Primary Schools a separate room is seldom provided for this subject, but one of the " general purpose rooms " may be used partly for teaching this subject. In Secondary Schools a special room is frequently required, with an area of 720 sq. ft., although it is sometimes used also for teaching book-keeping; a room larger than 720 sq. ft. is desirable for teaching geography, and particularly when it is to be used for both purposes. The room should be on the ground floor and have a south or south-east aspect; direct access to the open air is also useful so that meteorological instruments placed outside may be easily accessible. Provision should be made for the use of a lantern by the proper installation of blinds, electric power point and screen. A convenient size for the demonstration bench is 8 ft by 3 ft. Flat tables and chairs should be used, and not desks; it is usual to provide dual tables about 4 ft by 2 ft. Water supply and a sink are needed, either in the room or in the adjoining store. Plenty of wall space is needed for maps and pictures, in addition to the chalkboard; fixed battens for maps and a map cupboard at least 8 ft high should be provided at the teacher's end of the room. A display cabinet is needed with which may be combined a map-tracing table. A sand tray or table is also required, and is better if movable. There should be a storeroom attached with direct access; this room should be fitted with shelving and drawers for maps, slides, and specimens. Bookshelves should be provided in the classroom for the storage of large books, such as atlases and reference books.

As the geography room will generally be used as a form room, lockers for pupils using the room as a form room should be provided unless corridor lockers are generally installed in the school. Figure 41 illustrates a typical geography room. It is undesirable to use corridor borrowed lights if this can be avoided, as the wall space so lost is very valuable. The width of 21 ft shown in this figure is the minimum. For many of these special rooms a greater width is advantageous, although it is then difficult to meet daylight factor requirements.

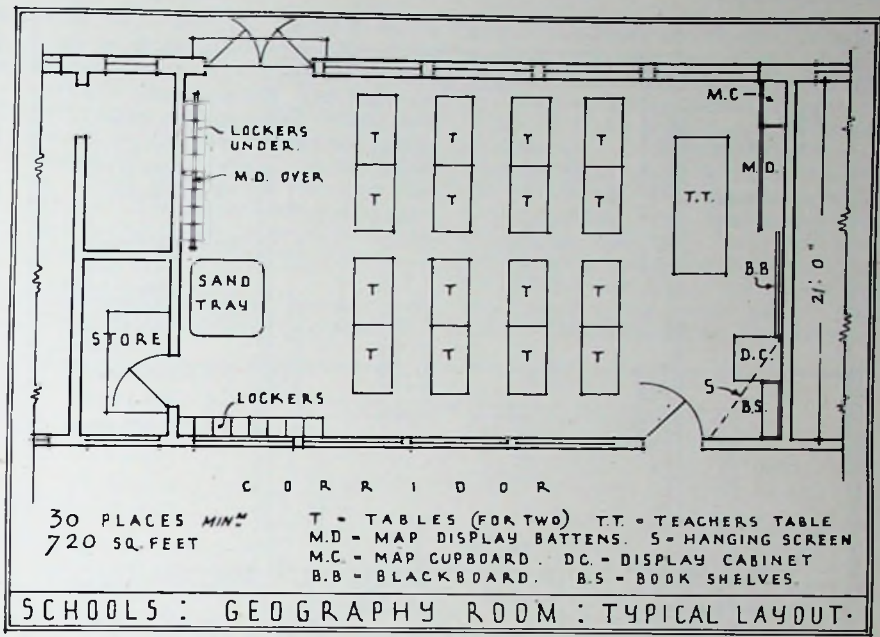


Figure 41

Housecraft Rooms—The teaching of this subject starts in the Nursery School, where the children help to serve their own meals and to keep themselves and the school clean and tidy. No special provisions in regard to planning are needed at this stage. In Primary Schools, also, there are no special provisions in planning, although there have been suggestions that a small room might be provided in the nature of an ordinary domestic kitchen living room, where children feeling unwell or in need of minor repairs to clothing, etc., may go.

In Secondary Schools, however, special rooms are required for all girls' and mixed schools and the number varies only slightly according to the type of school and only in proportion to the number of pupils in each school. Housecraft rooms should

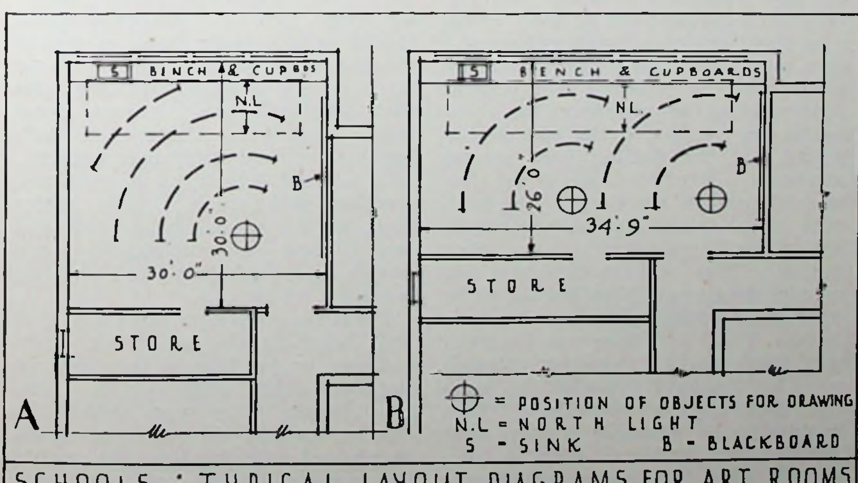


Figure 40

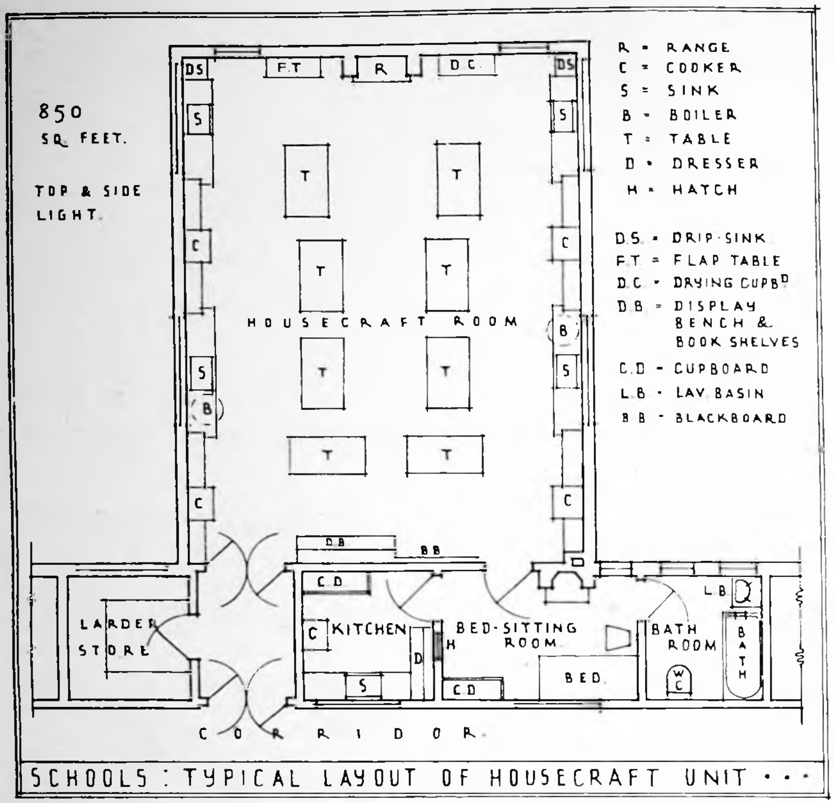


Figure 42

be at least 850 sq. ft. in area and the width should be at least 24 ft, in order to accommodate equipment satisfactorily. It is usual to teach half-classes at a time with a maximum of 20 pupils, and consequently in all larger schools two housecraft rooms are needed. The accommodation must provide for the teaching of cookery, laundry and needlework ; the cookery and laundry are often combined together except in more advanced technical schools, although there are some authorities who still prefer separate rooms for each of these two subjects. When two rooms only are planned for housecraft it is certainly better to combine cookery and laundry in one room and use the other for needlework ; in small schools with only one housecraft room, however, the triple combination becomes inevitable. It is usual to attach to cookery and laundry rooms two or three small rooms as an annexe in the form of a flat or suite of rooms, in which home management may be taught ; these rooms should be equipped and furnished in a manner similar to the homes of pupils and should represent a kitchen, bathroom and a bed-sitting room, or if space can be allowed a bedroom and a sitting-room.

Storage accommodation is of the utmost importance for the cookery rooms ; well-ventilated ample space is essential and if the teaching rooms are likely to be used in the evenings as well as in the day, additional and separate storage is needed ; this storage may be either a combined larder and store of about 100 sq. ft., or two separate rooms of equal area. The stores should be fitted with shelving from about 3 ft above the floor upwards, and ranging in width from 9 in to 18 in and in varying heights apart from 12 to 18 in ; one shelf should be of slate or tiles. A large refrigerator is desirable, but should not be placed in the larder store.

Housecraft rooms should be planned with easy access for tradesmen's deliveries. North aspect rooms may be used, although this is not essential, except for larders. Good ventilation is needed, particularly to prevent the penetration of cooking smells to the rest of the school. The usual school heating system is used for the rooms, but the pipes and radiators must be very carefully planned in conjunction with fixed equipment and apparatus ; care must be taken to avoid heating pipes near the larders. The general constructional requirements for these rooms are similar to the rest of the school, but the finishes need special attention. Hardwood blocks are frequently used for the floors of the main part of the rooms, but narrow boards are easier to clean, especially when greasy. Tiles or granolithic are too cold for the general floors, but should be used near sinks, cookers and wash boilers. Thick cork linoleum has been used but it marks with grease, although some of the hard types of the same material may be suitable. Walls require to be washable and are best painted, but materials such as tiles, glazed brick and cold glaze sprays should be used round sinks and draining boards. Windows should be large, but the need for wall space should keep them to the minimum required for adequate lighting. High and cross ventilation are most important, and special attention to the removal of steam may require special measures. Larder windows should be protected with wire mesh screens.

There are two main types of housecraft rooms for cookery and laundry, but many variations of these are possible ; Figure 42 illustrates a typical arrangement in which all the equipment for both cookery and laundry are planned along the two side walls and the home management rooms planned as a suite comprising a kitchen, a bed-sitting room and a bathroom adjoining the main room. Lighting is provided mainly on the two side walls over the fixed fittings, leaving the two shorter walls free for larger equipment. Figure 43 illustrates an arrangement, possibly more suited to senior pupils, based on a lay-out of fittings to form a series of similar units each complete in itself and arranged somewhat on the lines of a domestic kitchen ; in this type it is desirable to have a separate laundry annexe for at least that part of the work which involves the handling of larger articles ; such a scheme, however, requires a rather larger floor area and may involve some 1,000 sq. ft.

It is important that the planning of these rooms is based on proper layout of equipment and on a correct sequence of operation, as faulty positions make the work of the teacher difficult and also prevent pupils obtaining the best results. The proper sequence of operation due to the placing of equipment also trains the pupils to arrange work in a similar orderly fashion.

For cookery the following equipment is needed : sinks 24 in or even 36 in by 18 in, with draining boards on both sides, fitted at various heights from 30 in to 36 in to allow a correct height for each pupil ; at least one sink is needed for every four pupils ; one (or preferably two) bucket-sinks with grids should be provided. Cookers should be installed at the rate of one for every two or three pupils and should be of varying types, as used in the district ; provision must be made for a variety of fuels, including solid fuel, electricity, gas ; in rural areas where needed, oil. Other than wall-benching no fixed furniture is required ; dual tables, 5 ft by 2 ft 6 in, are usual, together with stools ; these tables must be strong and have hardwood tops. Ample wall-benching with cupboards and suitable slatted shelving is needed for utensils.

For laundry work the same similar in wall benching are used ; or alternatively, proper laundry tubs may be installed either singly or in pairs. Wash boilers of the types used in the district, fired by various fuels, should be planned adjoining the sinks or tubs and wringers for the correct sequence of operations. Provision should be made for electric and gas irons and also

for heating irons on the top of solid fuel and gas stoves. Overhead flexes should be avoided and plugs should be installed just above bench level. Hanging dryers are needed at the rate of one for every three or four pupils and also a large drying-cabinet. Local hot-water supplies are desirable by means of electric or gas water-heaters of adequate capacity, unless the rooms are planned close to other supplies available throughout the year.

In small schools the needlework room may have to be combined with other housecraft work, but whenever possible a separate room should be provided, as the equipment is very different and material may be damaged if cooking or laundry are done in the same space. The needlework room should be at least 850 sq. ft., for use by half-classes up to a maximum of twenty. Good light is essential on all working surfaces; sewing machines should be planned to have left-hand light. The equipment comprises tables, 5 ft by 2 ft 6 in, and one or two larger tables about 6 ft by 3 ft, machine tables, one for every three pupils for hand-, foot- and power-operated sewing machines, a long cutting-out and a pressing table, which may well be planned as a wall fitting; the latter should be associated with one or two sinks having double draining-boards. A display fitting in which fashion books, plates and general reference may be exhibited is needed and also a large chalkboard and several mirrors, some of which should be arranged as a triple mirror and screened off by curtains to form a fitting room. The needlework store should have an area of about 100 sq. ft.; it may also be used as a fitting room and should be fitted with adequate shelving and a large wardrobe cupboard. The floors of needlework rooms should be of hardwood or linoleum. The walls do not require any special finish, but should provide ample display space. Figure 44 illustrates a lay-out based on recent methods of teaching this subject. If the room is also to be used for evening classes the store should be doubled, as for the cookery room.

Typewriting Rooms—Special rooms adapted for the teaching of typewriting and office routine are required in commercial types of Secondary School. The floor area recommended is 900 sq. ft. Normal typists' tables, as used in offices, 3 ft by 2 ft, form the main equipment. Each pupil requires a separate table, good daylight, preferably from the left side and good artificial light from local individual sources are essential. Gangways not less than 2 ft and better 2 ft 6 in wide for general circulation for access to one side of every pupil's place; the rows of tables should be planned not

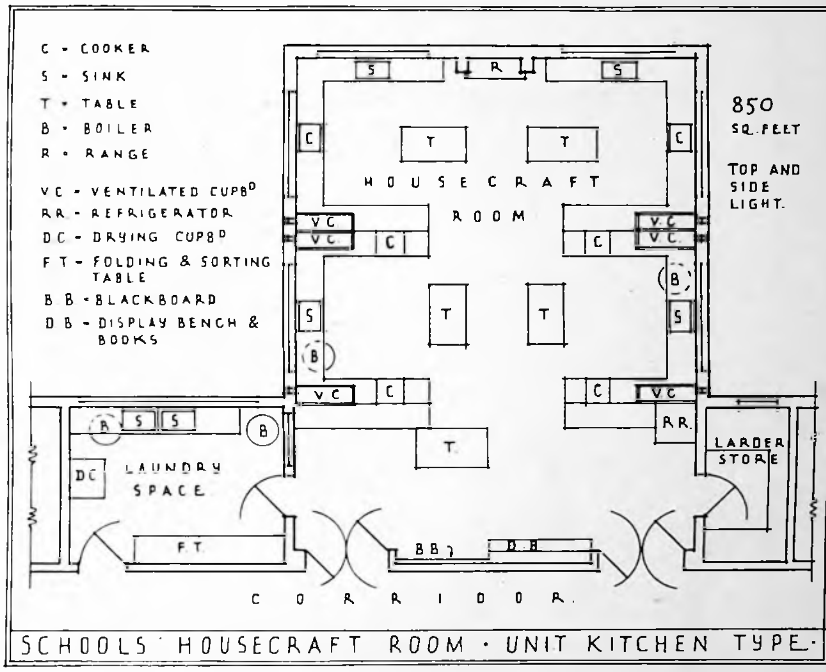


Figure 43

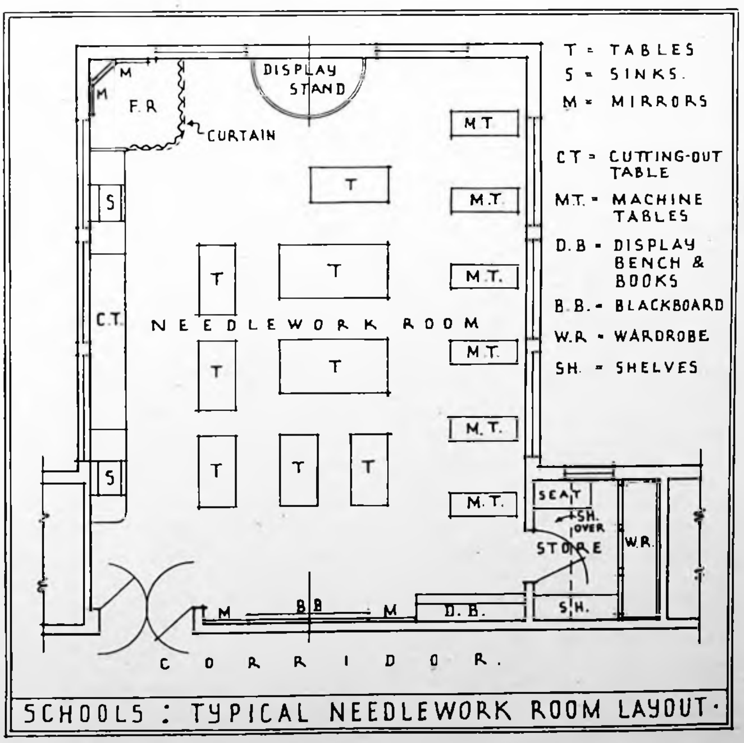


Figure 44

less than 3 ft apart to allow adequate seating space. The seating usually consists of adjustable typists' chairs of a normal type.

In view of the noise created precautions should be taken to prevent disturbance to the surrounding rooms by the introduction of sound-absorbent materials in the walls and in floors and ceilings of a multiple-storied building.

In addition to the typists' tables and chairs it is usual to provide two or three filing cabinets, one or more duplicating machines, a teacher's table and ample cupboard space for the storage of supplies and books. On the teacher's wall a chalkboard is needed, and also facilities for the display of large diagrams. If the room is used as a form room, book-lockers should be provided, unless accommodation is available in corridors or elsewhere.

Figure 45 illustrates a typical layout for a typewriting room based on the space requirements for a class of 30 pupils.

Science Rooms—No provision needs to be made for teaching this subject in Primary Schools, and even if it is touched upon in any way, the teaching

may either be in a normal classroom or in a general-purpose room.

All Secondary Schools, however, require special rooms for teaching this subject, and owing to the special equipment, often involving the installation of several services, including drainage in the floors, the location and planning of the science rooms have considerable influence on the planning of the whole school. The number of science rooms to be provided varies according to the size and type of school. The floor area for these rooms should not be less than 960 sq. ft.; larger rooms, up to about 1,200 sq. ft. are desirable for those general science rooms which have to serve for teaching several differing branches of science, or which may act as a combined classroom and laboratory. Preparation rooms are generally needed and should be attached to the science rooms; they should be about 230 sq. ft. each, but often one preparation room can be planned to serve two adjacent laboratories. The equipment can only be broadly dealt with in these notes, and therefore the information given is confined chiefly to information required in the general design of science units, especially with regard to structural requirements.

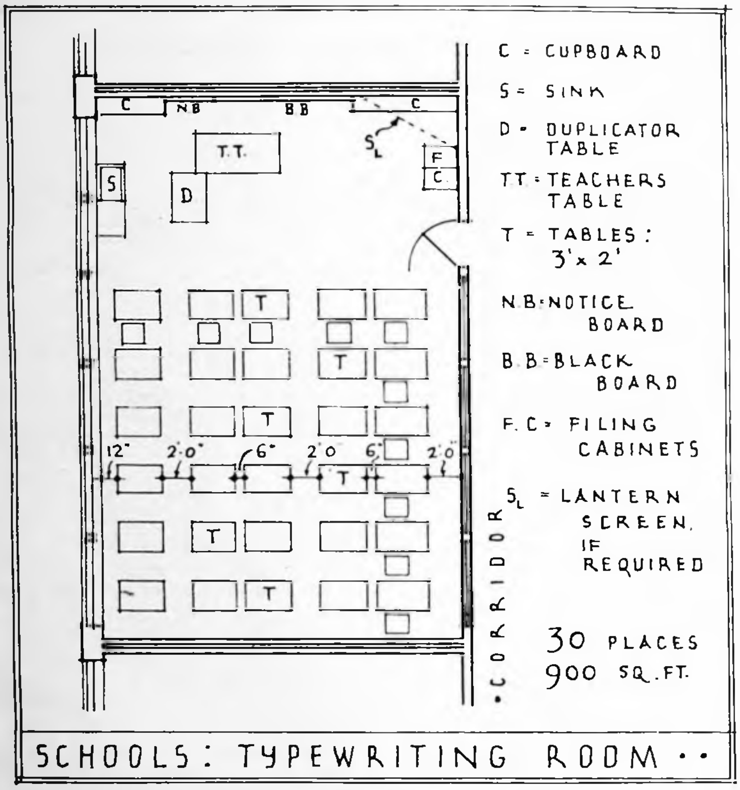


Figure 45

In smaller schools and in some types of school only one science laboratory is provided; it has, therefore, to serve for the teaching of all branches of science, elementary chemistry, physics and biology; such a room is termed a general science laboratory. When, however, several laboratories are provided, as in many larger schools, these may either be equipped as general science rooms or they may be assigned to the teaching of one branch only and the equipment specialised for the purpose. The rooms are planned on the basis of use by full classes of 30 pupils. Some schools, of the grammar or general type, where pupils remain to the age of 18 years, usually have one advanced laboratory and perhaps one for each of the three branches of science referred to above, especially when the number of advanced pupils is likely to be large; these advanced laboratories are usually smaller in area than the normal laboratories (about 450 sq. ft.) as classes are usually small (15 to 20).

Science laboratories of the normal classroom span of 24 to 25 ft require a length of about 40 ft to give a floor area of 960 sq. ft. and up to about 50 ft for those requiring 1,200 sq. ft.; it is often necessary to retain a constant span for ease of planning science units in conjunction with other special rooms. If spans of greater dimensions than 25 ft are used, it is essential that the rooms be lighted on at least two sides and the addition of top-light becomes almost essential. In rooms up to 25 ft in width, windows should be planned on one long side and should be so placed as to permit continuous wall benches to be installed below the sill level; windows should not be larger than necessary to light the rooms adequately, as some wall space over the benching between windows is advantageous.

Good ventilation is essential, including proper cross-ventilation, but care should be taken to ensure that windows or borrowed lights provided for the latter purpose only are high enough to leave plenty of clear wall-space for cupboards, diagrams and models; a good height is at least 8 ft from floor level to sill. Facilities to darken rooms are essential, particularly for teaching physics, and therefore top-lights are not very satisfactory. Blinds are sufficient for darkening rooms, shutters being both unnecessary and expensive. It is usually necessary to provide also for the darkening of preparation rooms.

Doors should be kept sufficiently far from the wall behind the demonstration bench to provide space for a lantern screen. Direct access should be provided between preparation or store rooms and the laboratories without the necessity of entering corridors.

A classroom adjoining the laboratories may be used for lecture purposes if a demonstration table and services are provided, but in the more advanced and larger schools a lecture room is often provided and sometimes this has accommodation for two classes. A preparation room should be available adjoining the lecture room. It is convenient when planning the lay-out of fixed benching in laboratories if floor space can be provided to allow for tables and seating adjoining the demonstration bench. In those rooms in which physics is to be taught, a clear space at one end of the room is desirable for placing and working of larger apparatus; a space of some 10 to 12 ft is desirable.

Benches may be of various types, dependent partly in the uses of the rooms and partly on the floor space available. It is usual to arrange benching at right-angles to the light to avoid any student standing directly between the light and the working surface. Single-sided benches are more costly, but they permit all students to face the demonstration bench without moving. However, the more general provision is double-sided benches. Single-sided benches should not be less than 2 ft wide and double-sided benches not less than 3 ft 6 in wide. Gangways between single benches should be at least 3 ft and between double benches at least 4 ft or preferably 4 ft 6 in.

Some laboratories have been designed, more particularly for physics and biology, based on the use of about 3 ft 6 in square movable tables accommodating four students each. Wall benches vary in width from 1 ft 6 in to 2 ft, those installed under windows should be provided with knee spaces between any cupboards arranged below the working surfaces. Fittings installed above bench tops should be 18 in clear of the tops. The walls opposite the window are usually unsatisfactory for working spaces, and are more usually used for storage cupboards, exhibit cases, diagrams, etc. Benches of all types are usually 2 ft 9 in high, except for advanced pupils, when 3 ft is more usual.

The demonstration bench is a very

important piece of special furniture. This varies in length from 8 to 15 ft, is usually 2 ft to 2 ft 6 in wide and 2 ft 9 in high. An extension flap is sometimes provided on one end to increase the length, and a sink should be fixed at the other end. Gas and electricity services are needed and the bench should be fitted with drawers and cupboards.

Science rooms may be placed with advantage in positions having aspects not required for general classrooms, for example on the north side of a block. It is essential that the rooms be grouped together. Top-light is useful and in consequence, science rooms are frequently placed on the upper floors of multiple-storied buildings; top-light has the advantage of leaving clear the lower portion of walls to receive apparatus and equipment.

Wall spaces should be as large as possible and finished with brickwork distempered or other similar finish and not plaster.

Drainage for the bench and other sinks must be carefully considered in order that it may be readily accessible at all points. Wastes may be either taken to settling basins under sinks and then to the outside, or be led away on easy accessible runs without interruption. A satisfactory system is to lead wastes directly into U-shaped channels embedded in the floor and covered by screwed boards. The floors of laboratories are generally finished with wood blocks, as these have been found to be the most satisfactory material to withstand the various materials which may be dropped or upset, and also because pupils have to stand for much of the time.

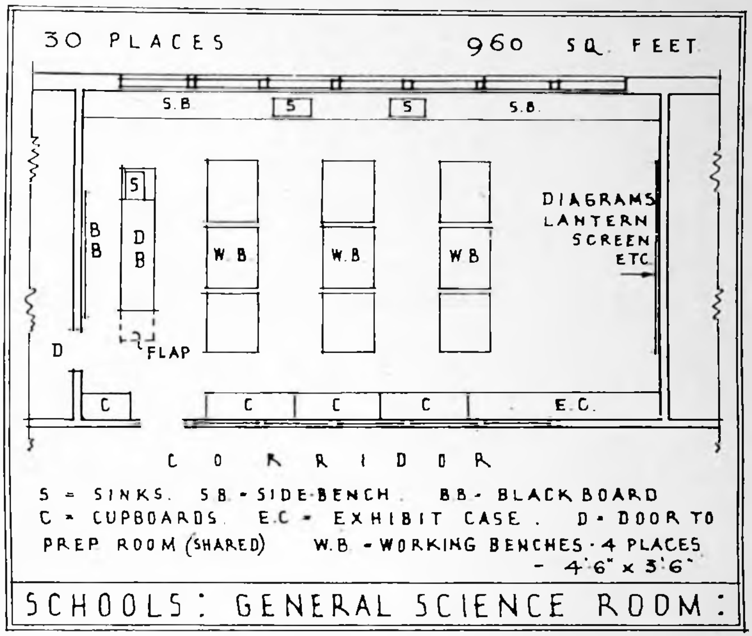


Figure 46

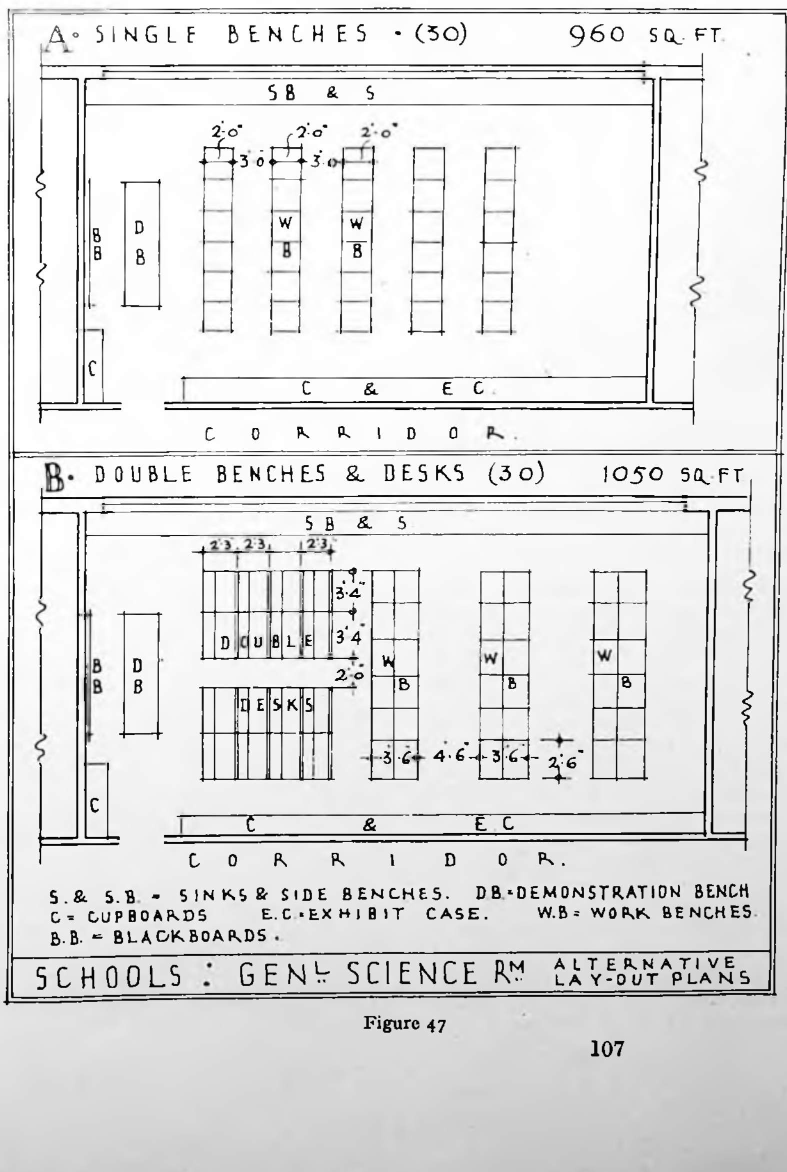


Figure 47

General Science Rooms—As already stated, these rooms usually have to serve for teaching of more than one branch of science; the equipment, must, therefore, provide for all purposes and may not be ideal for any one branch. Figure 46 illustrates a typical general science room for the teaching of elementary work and is based on the use of unit tables; these tables should be 5 ft long for two pupils, but it is sometimes necessary to reduce this length to 4 ft 6 in if sinks have to be accommodated between the benches instead of being planned at the side of the room, as shown; opinions vary very much as to the need for sinks in the benches for general elementary work and only appear to be really needed if chemistry is one or even the main subject to be taught in the room; if sinks can be kept to the side wall benching and on an external wall the difficulties of services, especially the wastes, are greatly reduced, and the use of movable tables becomes possible. If sinks are wanted in the working benches, the equipment has to be arranged in a similar way to that shown for chemistry laboratories in Figure 48. Movable tables are specially useful for the teaching of physics and biology, as large floor clear spaces may be formed at will. Gas and electricity are usually needed on the benches and when movable tables are used flexible connections have to be provided to floor outlets; it is, however, better to confine such services to wall benches whenever possible. In laboratories used for biology at least one sink 24 in

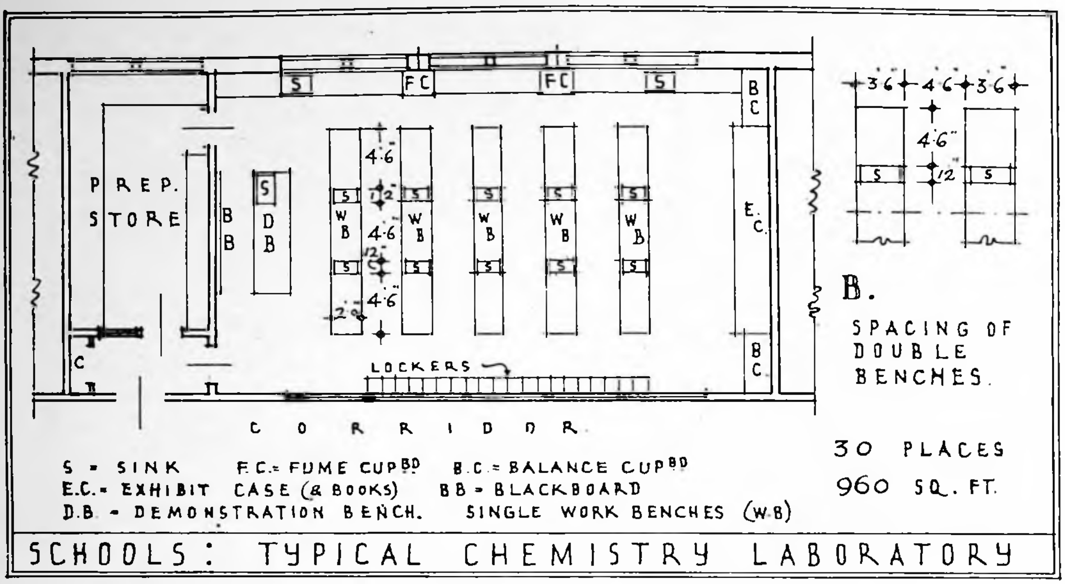


Figure 48

by 18 in by 10 in overall, of a domestic type, with two draining boards, should be provided ; any others should be small chemical sinks about 15 in by 12 in by 8 in overall.

Figure 47 A illustrates a general science room based on the use of single-sided benches, and B shows a larger room with class-seating in addition to laboratory benches, so that the pupils may be grouped and seated near the demonstration bench and thus have better facilities for note-taking and general written work.

Chemical Laboratories—These rooms are similar in area and generally of the same width as those for general science ; although 24 or 25 ft is likely to prove a good general span it may be reduced if wall benches are omitted. For elementary work bench lengths of at least 2 ft 3 in per pupil should be allowed but for more advanced work the length should be increased to 3 ft. There should be a sink adjoining each pupil's working space for advanced work but two sinks in each 15 ft length of bench is sufficient for general work.

Benches should be isolated to give complete circulation. In the lay-out shown in Figure 48 all students face towards the demonstration end of the room, whereas with double-sided benches pupils are face to face, a plan which is admittedly more economical in space, sinks and plumbing. The normal class of 30 should be accommodated on the central benches, leaving the wall benches for special apparatus. Separate balance rooms are not needed, as balances for ordinary use are placed with other apparatus on shelves in the laboratory, except special balances, which are kept in the preparation room. Balances for more advanced work require about 30 ft run of wooden shelving 15 in wide. All fittings and shelving should be of wood and the use of metal avoided. A furnace is needed in at least one laboratory and is usually placed on a stone shelf about 8 ft long and 2 ft wide with a hood over ; as a flue, and often an exhaust fan, has to be provided to furnaces these should be planned on an external wall or on the wall opposite the demonstration bench. One or more fume cupboards are needed in chemical laboratories and require an area of 3 ft by 2 ft and are fitted with a gas supply and an exhaust flue ; these may be placed in the lower part of windows or independently ; a type often used in schools is placed in the preparation room and behind a sliding chalkboard in the laboratory and is accessible from both sides. Advanced chemical laboratories usually need one larger type of fume cupboard, 4 ft by 2 ft 3 in, equipped with gas, a sink and water. Benches in chemical laboratories should be 2 ft 9 in high, with at least one drawer per pupil, the lower part clear, and each should be supplied with gas. In addition to bench sinks, one large-sized domestic sink with hot and cold water supply is essential for cleaning apparatus.

Biological Laboratories—Laboratories for this subject are better if placed on the ground floor, as access to the garden is desirable, and whenever possible, and especially in rural areas, a greenhouse or conservatory of some kind is needed adjoining the laboratories ; if a greenhouse cannot be planned, a Wardian case in at least one window is needed ; this is similar to a double window with a space about 2 ft wide between the sides, in which plants may be placed. These windows and greenhouses should have a southern aspect.

Rectangular tables are probably the best type of equipment for this subject, as sinks can usually be placed in the wall benches. Biological laboratories need at least four small sinks and two large sinks, the latter with draining-boards on each side. It is desirable to have a material store with direct access from the laboratories. Special optical rooms are not generally needed, except for more advanced work.

Physics Laboratories—When these are not used as general laboratories strong but easily moved tables form the best equipment. Dual tables (two pupils on each side) about 4 ft 6 in by 3 ft 6 in are more satisfactory than long benches, especially if the latter are fixed, as is more or less necessary with large fittings. If a large clear space about 10 or 12 ft wide can be left at one end of the room it is very desirable for large apparatus. Few sinks are needed ; these may conveniently be placed at 6 ft centres against the walls and between the tables Three sinks, one of which is for cleaning apparatus, and requires hot water, is a minimum. Services such as gas and electricity may be needed on all tables and can be arranged with flexible connections or may be supplied from walls or from overhead arms.

The lay-out of physics rooms of a more simple type are similar to the general science laboratories shown in Figure 47 ; more advanced laboratories are similar in regard to equipment, but need rather more space per pupil for apparatus.

Electric power in the form of direct current is often required, and suitable converting plant to produce it may be needed. Each demonstration table should have electrical supplies and about six other points are usually required.

Demonstration tables are usually raised on a low platform about 6 in high, with chalkboards behind them. The tables should be 10 ft to 12 ft long and about 2 ft wide, while the height should be about 2 ft 3 in, so that pupils may see on to it easily.

A sink, gas, water and electricity supplies are needed on the demonstration table, as well as a fume cupboard in close proximity and in full view of pupils.

Preparation and Store Rooms—These rooms should have a floor area of about 230 sq. ft., and the spaces for the preparation and storage are best combined in the form of one undivided space. The preparation room should be at least 10 ft wide and, if possible, the full width of the laboratory; it should have an external window and ventilation on the opposite wall whenever this can be arranged. The general equipment consists of drawers, shelves, cupboards, a bench, a sink and a fume cupboard. The sink is best placed in a wall bench under the main light of the window.

It is usual to plan these rooms between two laboratories or between a laboratory and a lecture room. Biology rooms and, whenever possible, general science rooms which are used also for the teaching of this subject, should have a material store adjoining; such stores should be about the same size as the preparation rooms.

It is desirable to group advanced laboratories with general laboratories allocated primarily to teaching the same subject with common preparation and materials rooms.

Lecture Rooms—In Secondary Schools of general type a lecture room is usually required in conjunction with the science rooms. The area needed is 540 sq. ft.; this can be developed to seat a class of 30 pupils if a lay-out based on dual desks with gangways between, as shown in Figure 49, is adopted, but in the same area by with varied dimensions it is possible to plan a lay-out to accommodate two classes of the same size if continuous rows of desks are used with a central gangway.

Seating should be based on 1 ft 10 in minimum length per pupil and 2 ft 9 in from back-to-back of the benches. The benches should be raised in tiers which are usually either 7 in above each other or in gradually increasing heights of from 6 in to 12 in, but there seems little advantage in the latter arrangement in rooms of comparatively small dimensions. A space of not less than 3 ft 6 in should be provided between the demonstration bench and the front row of seats. The tiered floor must be borne in mind when relating the lecture room to the general plan, as the room entrance should be at the lowest level and near the demonstration table. The demonstration table and equipment is similar to that required in laboratories and has been previously described. Good lighting is essential, but windows should not be planned facing the lecturer. The windows must be capable of being darkened. A large movable chalkboard of the sliding type is required on the wall behind the demonstrator and a lantern and screen should be provided. Figure 49 illustrates a typical lay-out for a lecture room and Figure 50 shows detailed dimensions for seating.

Handicraft Rooms—Subjects for which these rooms are planned vary considerably; the two most general being the teaching of simple woodwork and simple metal-work; in those schools, however, having a technical bias, the range of subjects extends to cover all the elementary branches of building, engineering and, in some areas, the needs of other specialised trades.

All types of secondary schools, except those exclusively for girls, require one or more handicraft rooms of at least 850 sq. ft. each. When only

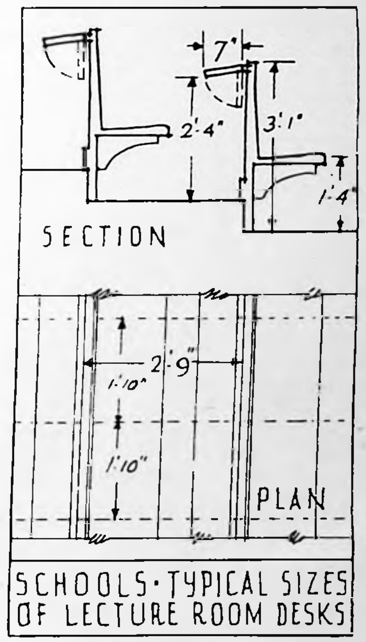


Figure 50

one room is provided, as in one-form entry schools, it usually combines wood- and metal-work and in some areas, especially rural ones, a forge room or annexe is sometimes provided in addition; when two or more rooms are provided they are usually allocated to one specific type of work and suitably equipped for that one subject only. Workshop rooms should, however, always be grouped together with materials, stores and, when possible, stores for work in progress. In the technical types of school rooms become more specialised and much larger in area—usually 1,200 sq. ft. or more and equipment is correspondingly increased.

It is usual to base accommodation on the needs of half classes, with a maximum of twenty pupils. The rooms should be designed primarily as workshops rather than as schoolrooms. It is desirable that the rooms have a width of at least 24 ft to accommodate the equipment adequately, though when independent buildings

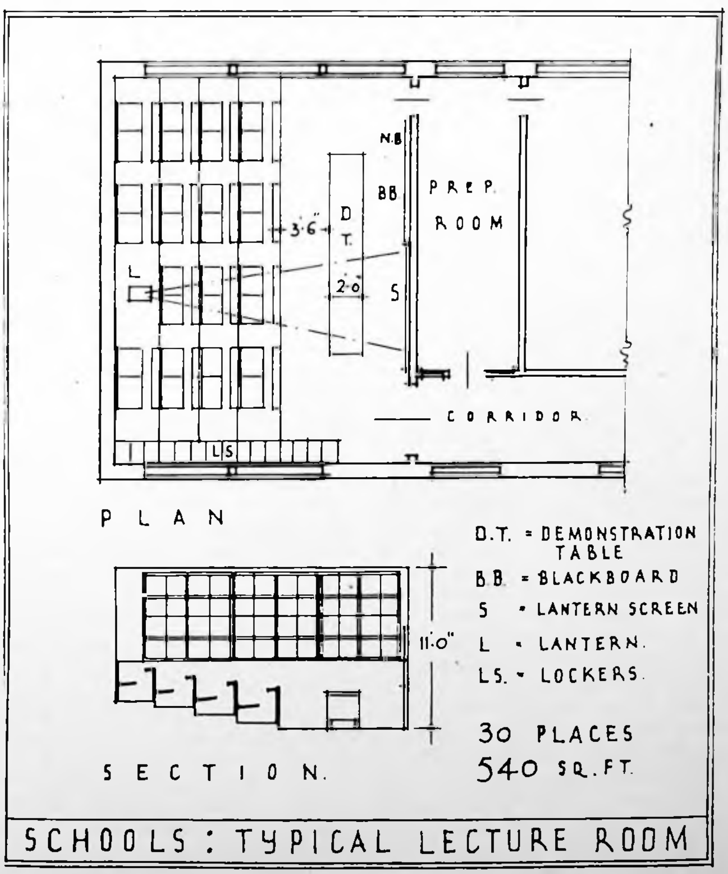


Figure 49

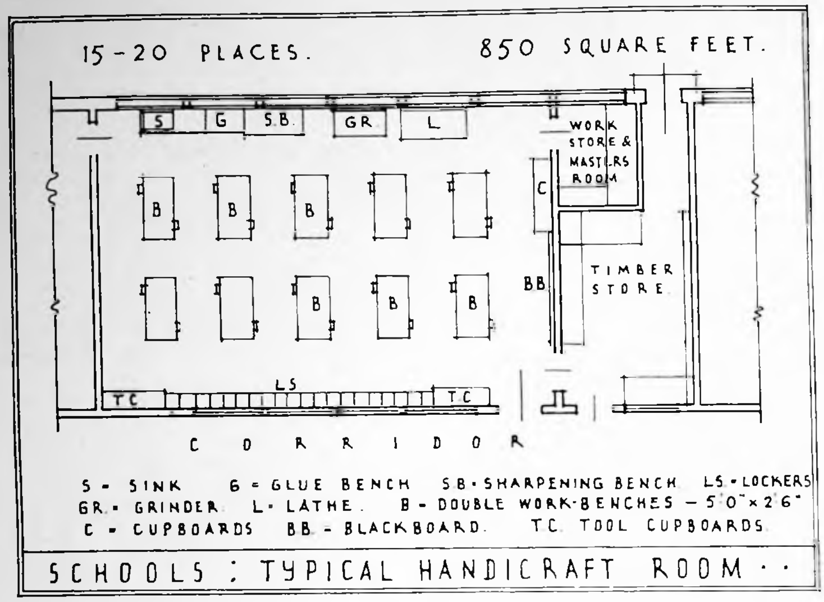


Figure 51

room, combined wood- and metal-working benches are available, but it is preferable that a part of the room be devoted to each purpose, the more usual arrangement being to allocate the centre of the room to woodworking benches and use wall benches for metal-work.

Figure 52 illustrates a typical advanced metal-work room. For more elementary work the bench portion without the forge annexe is usually adopted. Metal-working benches are usually about 12 ft long by 3 ft wide, providing a working space for six pupils. The wall benches should provide for soldering, and gas points are here required. It is desirable to group machines in these rooms together, preferably at one side of the room. When provision is made for a forge and equipment such as smith's and brazing hearths, a concrete or similar floor should be provided, and also direct access to the open air. Forges require a flue, hood and extract fan and consequently are

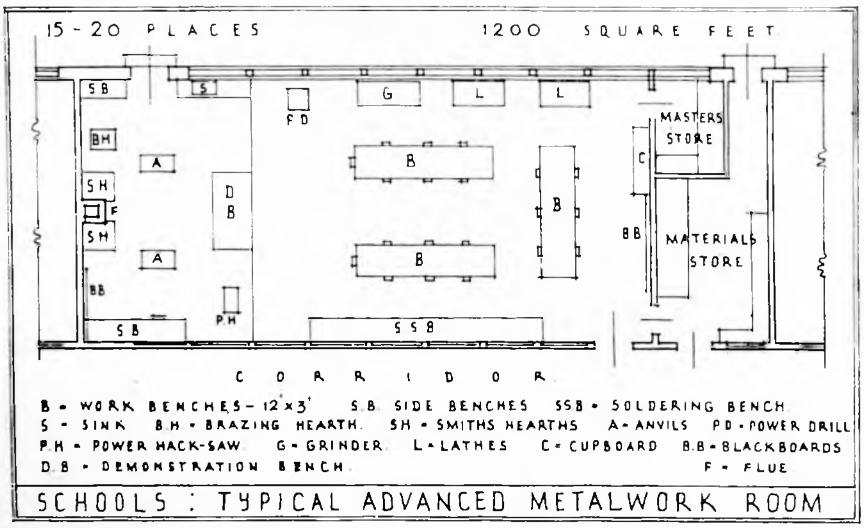


Figure 52

are used, spans up to 30 ft may be found to be more convenient. If the rooms do not form part of the main building of a school the construction may be very simple. The height need only be 9 ft to the wall plate and the roof may be open with skylights on the north side. Ample light and ventilation are very essential. If, however, the rooms form part of the main building, a height of 11 ft or 12 ft is desirable, with windows on the two long sides when possible and with top-light in addition when the rooms can be arranged on upper floors or as single-story units.

It is convenient if a classroom can be grouped with the workshops for the teaching of mechanical drawing or, if not, the rooms should be increased in size to allow space for drawing tables for a proportion of the pupils.

The floors of handicraft rooms should be covered with wood blocks or boarding to avoid damage to tools when dropped, except in positions near such equipment as a forge, where there is fire risk. The walls are generally of distempered brickwork. Windows should be almost continuous for the length of the room on both sides. Good artificial light is also important, particularly if the rooms are likely to be used for evening classes.

Clothes pegs should be provided in handicraft rooms or, alternatively, lockers which keep the clothing cleaner than when hung on pegs. It is an advantage to plan the clothes pegs in an entrance lobby and to place with them some lavatory basins, especially if the lavatory block is not very near the workshops. A first-aid cupboard and additional fire-fighting apparatus are also needed.

Figure 51 illustrates a typical handicraft room adapted for woodworking. The furnishings consist of double-sided benches about 5 ft long by 2 ft 6 in wide, for one pupil on each side. The benches should be spaced at least 3 ft 6 in apart and 3 ft should be allowed between ends of benches. It is usual to place all the benches in the centre of the room, leaving the side walls clear for plant requirements, such as glue benches, grinders, a sink and tool cupboards. Power-driven machinery is seldom provided in more elementary rooms, but provision must be made for a number of machines in those rooms used for more advanced work. Tool racks may be either against the outer walls or, alternatively, on a screen running down the centre of the room, for which the central gangway must be increased to a width of at least 5 ft. Some tools are kept in cupboards in the benches in some schools, but opinions as to the desirability of this procedure vary. Gas points are required for glue pots. The tools and general equipment have been standardised for schools by many firms. In some schools, where both wood- and metal-work are taught in the same best placed against a cross-division wall to avoid obstructing window space or external walls. Storage for materials is of great importance, and as the materials are frequently in long lengths provision should be made for racking at least 16 ft long; external access for delivery of materials is essential and also direct access from materials store to workshops. It is usually convenient to place the materials store, with stores for the master and work in progress, together at one end of the workshop as illustrated in Figures 51, 52 and 53. If the rooms are used for evening classes in addition to day classes, additional storage space is necessary for work in progress. It is desirable, but not always convenient, to provide a large display case with glazed doors in which exhibits of work may take place. A chalk board is essential in all workshops.

Figure 53 illustrates a typical carpentry workshop with an area of 1,200

sq. ft. for the technical type of school. It should be noted that benches are concentrated at one end of the room, machines at the other and the demonstration bench in the centre. Chalkboards are provided at both ends of the room, and the remainder of one end wall is used for tool cupboards It should be noted that machines are not placed in rows but staggered to permit of machining of long lengths of material without interference with the work on adjoining machines. Wide openings are provided from outside into the timber store and from the store into the workshop ; it is often convenient to use sliding doors for these wide openings, as they occupy less floor space. The machines should be of the types general in trade workshops, but care should be taken to provide only those machines which are not specially dangerous and these only when carefully guarded. It is desirable to drive machines with separate motors rather than provide power from shafting.

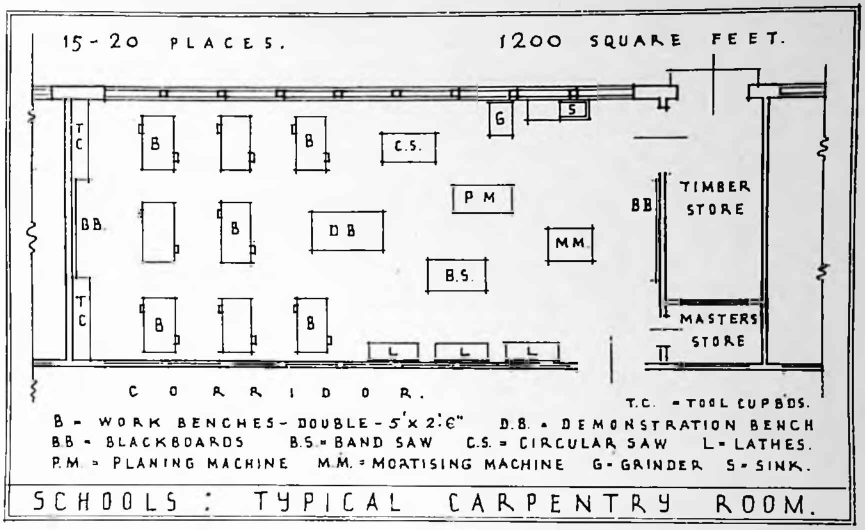
In rural areas the forge should have ample space adjoining in which agricultural implements may be placed for instruction in repair work, and consequently large external openings are essential ; it is also wise to plan the forge and metal workshop near other practical rooms or buildings used for training in rural activities.

In all workshops used for teaching in connection with large implements, motor or aero engines, facilities should be provided for fixing overhead lifting tackle.

In Technical Secondary Schools for the teaching of boys, between the ages of 11 and 16, and even to 18, the equipment of workshops closely resemble that normally used in ordinary workshop practice. These workshops are usually devoted to one particular trade and the area needed for each is 1,200 sq. ft.

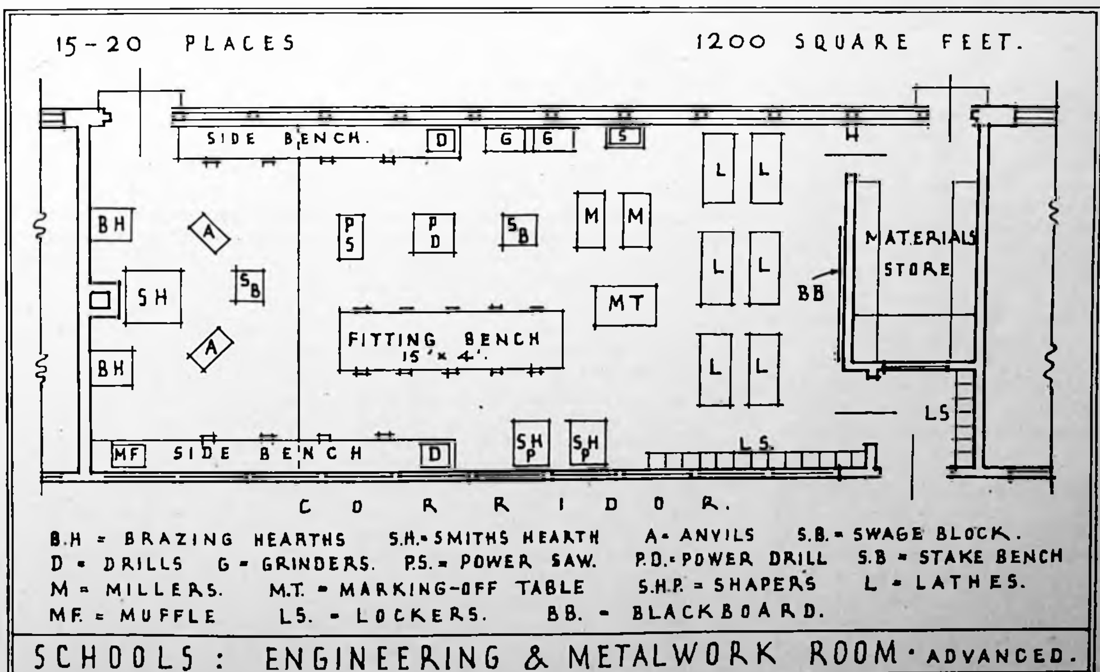
Woodwork and carpentry workshops require the benches to be assembled at one end of the room, preferably round a large demonstration bench. The benches are usually dual, 5 ft by 2 ft 6 in, and the demonstration bench should measure 6 ft by 3 ft 6 in. Machines should be placed together at one end of the room, and care must be taken to allow adequate space for feeding long lengths of material into the machines. It is advantageous to place lathes in front of windows to ensure the best possible light.

Engineering workshops tend to vary considerably in equipment, mainly according to the types of trades carried on in the neighbourhood of the school. In some districts a considerable demand exists for sheet metal work and this requires extensive space with large bench-tops and relatively little power plant. Figure 54 shows a general engineering workshop, one end of which is devoted to plant requiring heat and a solid floor of incombustible materials. The other end of the room is devoted to general machining. One large fitting bench is provided in the centre of the room, and side benches for part of the length of the side walls. It is desirable that the rooms should be not less than 24 ft span, and it is preferable if the span can be increased to about 30 ft, which is often possible where workshops are planned in a single-story detached block. Direct access to the open air is desirable from most workshops and from all materials stores.



SCHOOLS : TYPICAL CARPENTRY ROOM.

Figure 53



SCHOOLS : ENGINEERING & METALWORK ROOM · ADVANCED.

Figure 54

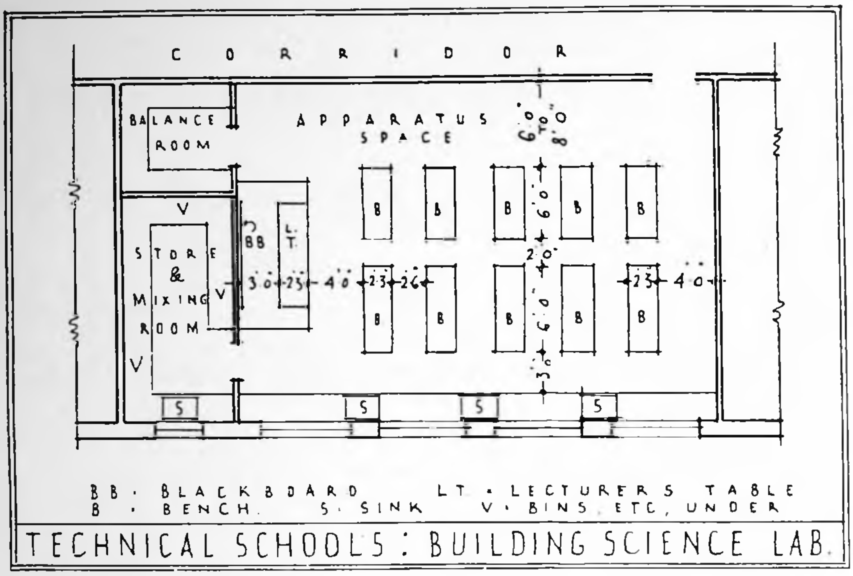


Figure 55

General Building Workshop—The rooms for this purpose require little in the way of special equipment beyond a certain number of benches suitably designed for each trade. Trades most likely to be provided for are: plumbing (if this is not taught in a metal workshop), bricklaying, plastering, painting and decorating; the rooms should have hard floors, water supply to sinks, and plain brick walls. A number of small stores are desirable for materials which, with advantage, may often be divided up into small bunkers or bins. It is desirable that painting should be separated from any trades which involve dust.

Building Science Laboratory—It is frequently necessary to equip one laboratory specifically for the purpose of teaching building science which involves chemistry and physics, but such laboratories can be equipped on very similar lines to the general laboratories. Figure 55 illustrates a typical building science laboratory; plain-topped benches 6 ft by 2 ft 3 in to accommodate two pupils each are usual, and it is preferable that these be movable, consequently sinks should be confined to wall bench fittings. A large clear space, either at one side or at one end of the room, is often considered essential for large apparatus. A small balance room, in the form of an annexe, is desirable, together with a store and mixing room, which should have cupboards, benching and a sink; these laboratories are usually 960 sq. ft. in area.

Drawing Office—A drawing office is needed in all technical schools, and should have an area of at least 900 sq. ft. Drawing offices are apart from and additional to rooms needed for general art subjects, and generally are planned near the building and engineering rooms. There are two main types of drawing office; rooms used solely for the purpose of drawing, and rooms which also have to serve as normal classrooms. In the former, high tables or benches are usually provided, and in the latter, normal height desks or tables have to be used since high benches, even with stools, are unsatisfactory for classroom purposes; it should also be appreciated that such accommodation is make-shift and not suitable for more advanced teaching of drawing. Junior students usually use "half-imperial" drawing boards and tee-squares, and two students can be accommodated in a length of 5 ft 6 in, or even three in 7 ft 6 in, but it is more satisfactory to allow 3 ft run of table for each student. Senior students usually need larger boards (up to "double elephant") and more bench space for instruments, books of reference and drawings to be consulted; a length of 4 ft or even more, according to the type of work, is therefore essential for each student; architectural students, however, may require at least 6 ft. The width of tables for general purposes should be 2 ft 9 in, and better 3 ft, but this is often reduced to 2 ft 3 in, which will accommodate an "imperial" drawing board. The gangways between tables should be at least 3 ft wide, and preferably rather more when larger boards are used; this gangway width is controlled by the fact that students may wish to stand up when working and may need to work on the long dimension of the drawing boards. Where classrooms and studies are combined, tables of the normal height of 2 ft 6 in should be installed, although tables of lower heights are sometimes used. Normal drawing tables should be 3 ft high, so that students may stand up and work comfortably. Foot-rests are desirable on high tables. Tables should have flat tops with blocks for tilting drawing boards. Adjustable drawing boards on stands (as used in engineering drawing offices) are seldom provided in schools. Good daylight is most essential in all drawing offices, and the source of light must be in front of the student or from the left-hand side. It may, therefore, be considered more satisfactory to place tables parallel with the window wall instead of facing towards the lecturer's table and the blackboard at one end of the room. Figure 56 illustrates two alternative arrangements of tables in drawing offices. Diagram "A" is based on providing left-hand light for students and diagram "B" is arranged so that students have the light directly in front. Type "A" may be found to be more convenient where students have to take notes or make drawings from diagrams on the blackboard. It should be noted that where there are long rows of tables as in Diagram "B" the gangway spaces should be increased to a minimum of 4 ft to allow circulation without undue disturbance to seated students. At least one large wall area should be available for the exhibit of drawings, diagrams and models, as the latter are liable to become very dusty, glass-fronted cases could well be included in the equipment. It is essential that each room is equipped with a deep sink and a draining board. Where planning permits there should be direct access from the drawing office to an adjacent store without entering the corridor. If the room is regularly used by one class it is desirable to provide lockers in the drawing office; these lockers should be large enough for the storage of privately-owned reference books, instruments, etc. Blackboards are essential, and it is usual to provide a lecturer's table or desk, although for the teaching of some subjects this may be considered unnecessary. The aspect of drawing offices should, where possible, be to the north or north-east. It is an advantage to have top-light in addition to side-light, to give adequate light to the desks furthest from the window wall.

Ample space must be provided for the storage of drawing-boards, tee-squares and drawings. If rooms are likely to be used also by evening students, the amount of space necessary may be considerable; it being desirable on many occasions that unfinished drawings should not be removed from drawing boards and the storage must be arranged in a manner to avoid damage. The best method seems to be to provide racks for the vertical storage of boards inside cupboards which can be closed to keep dust away from the drawings. Racks should be provided for each size of drawing board used, with an allowance of approximately 3 in from centre to centre of boards. Tee-squares can be stored with the boards or suspended on separate racks. Many departments require considerable storage space for the models and samples used for demonstration purposes; these can be placed on shelves in cupboards, if their size will permit, so as to eliminate constant cleaning and reduce the likelihood of damage. The storerooms should, if

possible, occupy a space the full width of the rooms and 8 to 10 ft wide.

Rural Activities—There is a growing tendency to make provision in schools in rural areas for the teaching of subjects directly allied to rural life, such as horticulture and agriculture. As this tendency develops, suitable buildings, specially designed for these purposes, will be needed in addition to those already mentioned, such as biology laboratories with a greenhouse attached, and handicraft rooms with annexes for the repair of garden and farm implements. When space permits the greenhouse should be detached and thus not shaded by adjoining buildings and planned, if possible, in proximity to both the biology laboratory and to the gardens. A covered space partially enclosed by walls should be planned for the storage of implements and supplies such as fertilisers. This space should also provide benching on which operations, such as potting, may be carried out. It is desirable, also, to arrange for an enclosed frost-proof room in which storage of horticultural produce may be demonstrated. It is essential that all these provisions are planned near the gardens, but it is also advantageous if they be not far distant from general workshops and science laboratories.

In schools in which subjects allied to agriculture are likely to be taught, there may arise a need for a miniature farm, providing suitable buildings for the keeping of rabbits, pigs, and possibly, cows. Fodder stores will be needed, appropriate to the animals to be kept, and in the case of pigs this will involve provision for the boiling of swill. A dairy with heating plant and a space large enough for cheese- and butter-making by a number of pupils at the same time may also be required. The latter should probably have an area of at least 900 sq. ft. in order that it may be used as a classroom for lectures and demonstrations in connection with the farm work. It is desirable that farm classrooms are planned round an enclosed courtyard. Covered space for the storage of implements and an enclosed garage may also be needed in this type of establishment.

Music—No specific provision is made in the Building Regulations, nor in the accompanying Memorandum for the teaching of music and allied subjects. For class teaching of singing and subjects such as appreciation of music, it is quite usual to use the assembly hall, which is also used for training in the dramatic arts.

In Secondary Schools, where instrumental music is taught, provision may have to be made for a room large enough to hold a small orchestra for rehearsal, although again, it is likely that the assembly hall will be used for the purpose ; but for the teaching of individual instruments and for practice, small rooms are necessary ; these rooms should be about 8 ft by 6 ft 6 in, or slightly larger.

Practice rooms should be placed, wherever possible, away from the main school buildings to prevent sound penetrating through open windows of other rooms, especially classrooms ; each room should be sound-proofed from its neighbour. To achieve real sound elimination between rooms, very special care should be taken in construction ; single-story buildings can be dealt with more easily. Two thicknesses of 4½ in brickwork with quilting on battens between, covered with an acoustic wall board, make a really satisfactory partition if carried up from the foundations, thus separating the floor of each room ; other good partitions may be built up of studding, quilt and plaster. Special precautions, such as rubber or felt stops, should be fitted round the door openings and quilt backing prevents leakage round door frames. Doors should be covered with quilting. Special care should be taken to prevent transmission of sound through heating or other surface pipes. (Fuller information on this subject is set out in " Planning for Good Acoustics," by Bagenal and Wood.)

Libraries—A special room to serve as a library is not usually provided in Primary Schools, but it is advantageous to provide some cupboards and shelving in one of the general-purpose rooms, where books may be kept systematically as an encouragement to pupils to learn to use a library. In Secondary Schools a special room is required to be set aside for the purposes of a library, and the Building Regulations require that an area of 600 sq. ft. should be allocated in smaller schools (one-class entry) and 960 sq. ft. in the larger types of school. These library rooms usually have to serve for the dual purpose of study and recreative reading, and have therefore to provide facilities for working from books under the guidance of a teacher and also be available during the midday recesses and after school hours as general reading rooms ; more particularly, in view of the latter, it is undesirable that the library be used as a teaching room, as is so often the case, even for sixth form or similar advanced pupils. The room should be in a pleasant position, quiet, central in relation to all parts of the school and well lighted. The rooms should be made attractive and generally inviting to children. Windows must be well arranged to leave adequate wall space for shelving, either against or at right angles to the walls. A very helpful report, " Libraries in Secondary Schools," was prepared in 1936 by the Carnegie United Kingdom Trust, in which much useful information is given ; this report suggests that " no library can be considered as adequate which does not provide thirty-five or forty square feet of space per pupil " based on the maximum number estimated to use the room at any one time ; this area should be inclusive of shelving, tables, chairs and gangways. The ordinary classroom height is adequate as shelves extending to a greater height than 7 ft 6 in are out of ordinary reach and consequently valueless. A good general average area for windows is 20 per cent of the floor area. Windows are more satisfactory if the sill levels are 4 ft 6 in above the floor so that bookcases may be placed below them and the attention of readers not unduly distracted by too open a view ; some authorities, however, suggest that the room is more attractive and pleasing to the children if the window sills are at table level (30 in) ; if, however, " alcove " or " bay " layouts are adopted, sill levels should be lowered to table level to provide good light on the tables.

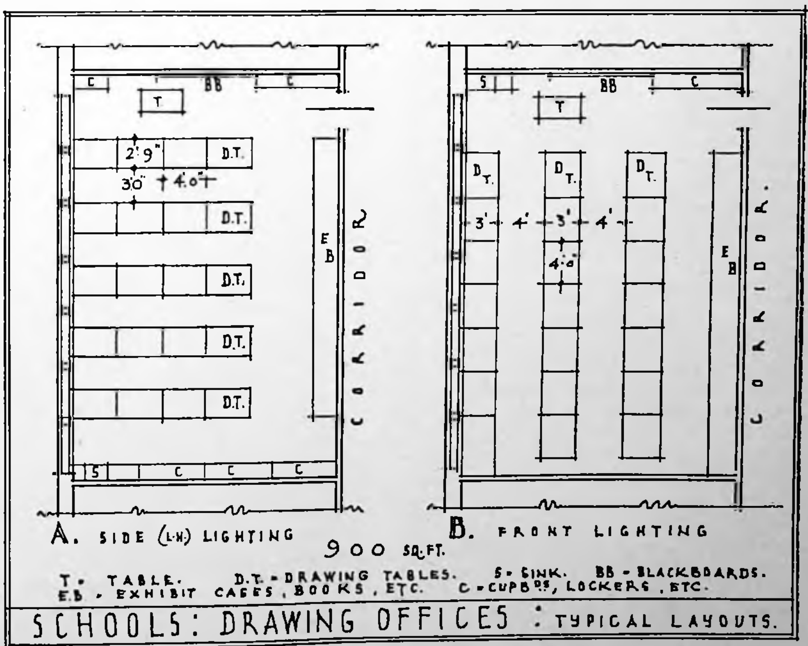


Figure 56

Open shelving (not closed cases) should be used throughout to provide easy access to books ; shelves may be plain wooden or metal shelving, and should always be vertically adjustable. Bookcases are generally arranged in standard lengths of 3 ft or 3 ft 6 in, sometimes subdivided to give extra strength for heavy volumes. Island cases with books accessible from both sides have an average overall width of 20 in ; frequently, however, provision is made for large books in the lower part, which is made from 2 ft to 3 ft wide, thus forming a shelf on each side about 2 ft 6 in above the floor, which is a convenient rest for books. Wall cases are usually 10 in deep, although it is sometimes necessary to make provision for some large books by having 12 in deep shelving, the depth being dependent on the type of books needed in the library ; technical books are often somewhat larger than other types. Figure 57 illustrates the main dimensions of typical school library shelving.

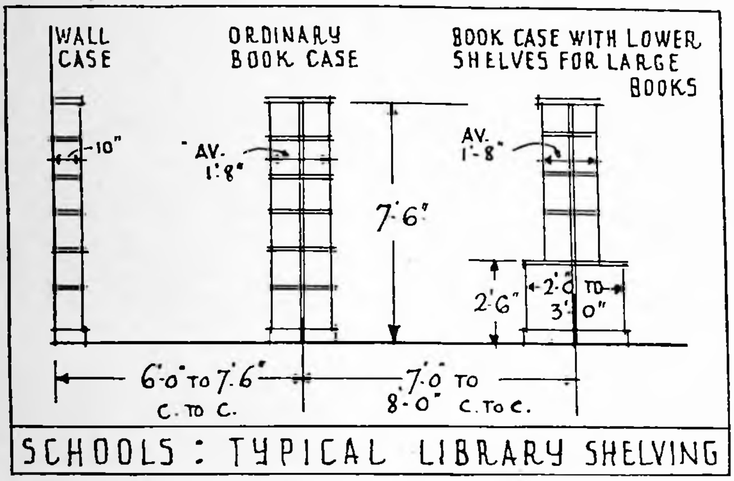


Figure 57

Cases projecting from walls should be at least 6 ft apart, unless tables are placed between them, when 10 ft is necessary. Bays in which tables are used should not be too deep for easy supervision, but 9 ft 6 in is needed to accommodate a table for six persons, allowing circulation space on the window end, as is illustrated in Figure 58.

Figure 59 illustrates two typical library plans. Diagram A shows a room based on 960 sq. ft., arranged to provide alcove tables and seating ; the island bookcases forming the alcoves being placed with one end against the window wall, so that the tables may be reasonably near the light, leaving the less well-lighted parts of the room for general circulation ; libraries based on this type of plan provide a large amount of shelf space relative to the floor area. Diagram B illustrates a smaller library based on 600 sq. ft area, in which the shelving is confined to three walls with a small additional space below the windows.

Tables in the library should always be movable.

If reading alcoves are provided on both sides of the room, a very considerable increase in width is needed. A table to seat three persons on each side should be not less than 6 ft long and is better if 7 ft 6 in long, especially if used for classwork, where reference to books is constantly needed. Double-sided tables should not be less than 3 ft and single-sided tables should be 2 ft wide. If island bookcases are used on both sides of the room, gangways between the ends of these cases should not be less than 6 ft, and if a central table is required then the width should not be less than 12 ft to provide for a table 3 ft wide with chairs on both sides. It is essential to have adequate space in alcoves to allow circulation between the chairs and the face of the book-shelves. When alcoves 9 ft 6 in deep are used on each side of the centre gangways, the total width of the room should not be less than 31 ft between walls, and this width is likely to be inconvenient in many plans unless the library is planned as an independent block ; the plan Type A shown in Figure 59 is, therefore, likely to prove the most useful, as this scheme can be accommodated in widths of 20 to 24 ft. Books are heavy and floor loads up to $1\frac{1}{2}$ cwt per sq. ft. should be allowed. The floors should be finished with a material to reduce noise to a minimum, but must combat hard and localised wear, as most traffic tends to occur near the shelves and particularly in aisles between closely-spaced island shelving. Compressed

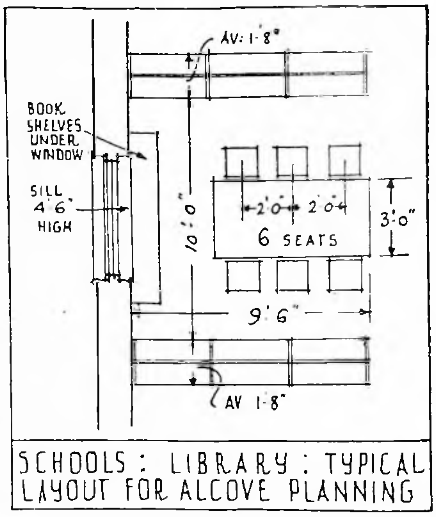


Figure 58

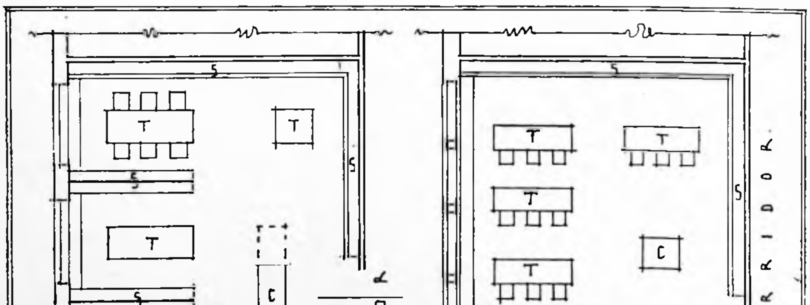


Figure 59

cork or heavy linoleum have proved satisfactory.

Some subsidiary rooms and spaces are desirable in addition to the library itself, but such are often difficult to provide in schools ; the librarian should have provision for keeping records, and a room for this purpose would provide also space for the librarian's workroom. If space permits a special room devoted to periodical reading is a very useful addition to the normal library facilities of the school. Except in very large schools it is undesirable to provide departmental libraries as part of individual departments, and it is better that all the books of the school be combined to form the one main library.

In all libraries, especially those to be used by the more advanced students, proper provision should be made for catalogues, general reference books and the display of new acquisitions.

Assembly Halls—An assembly hall is required in all schools except Primary Schools having one class only ; the value to be derived from the many uses to which school halls can be put is becoming more and more realised, both for the pupils and teaching and in connection with events when the presence of parents is desirable. In many districts it will also be needed for such essential activities as old school gatherings, Women's Institute meetings and similar local community functions. This is especially applicable in country districts where village halls are not available.

Assembly halls have been used in the past for physical training, to the detriment of the proper uses, and except in one-form entry types of secondary school, the regulations now require separate gymnasia for all Secondary Schools, but in Primary Schools no gymnasia are called for.

Halls should be so planned that noise arising from singing or games does not disturb pupils in the classrooms which should, in no circumstances, open directly from the halls. Halls should be separated as much as possible from teaching rooms, and are therefore most satisfactory if partially detached from the main classroom blocks. Aspect is of little importance, but good light and whenever possible cross ventilation, is essential. When halls are to be used for outside activities, the importance of approach so that visitors do not pass into the school proper is important, as has already been discussed in connection with the general lay-out of school buildings. It is an advantage if cloakrooms can be planned in close proximity to the main entrance to an assembly hall, to be available for use in connection with any function which may take place in the hall.

Where there are a number of separate departments in a school it is usually more convenient for each department to have its own assembly

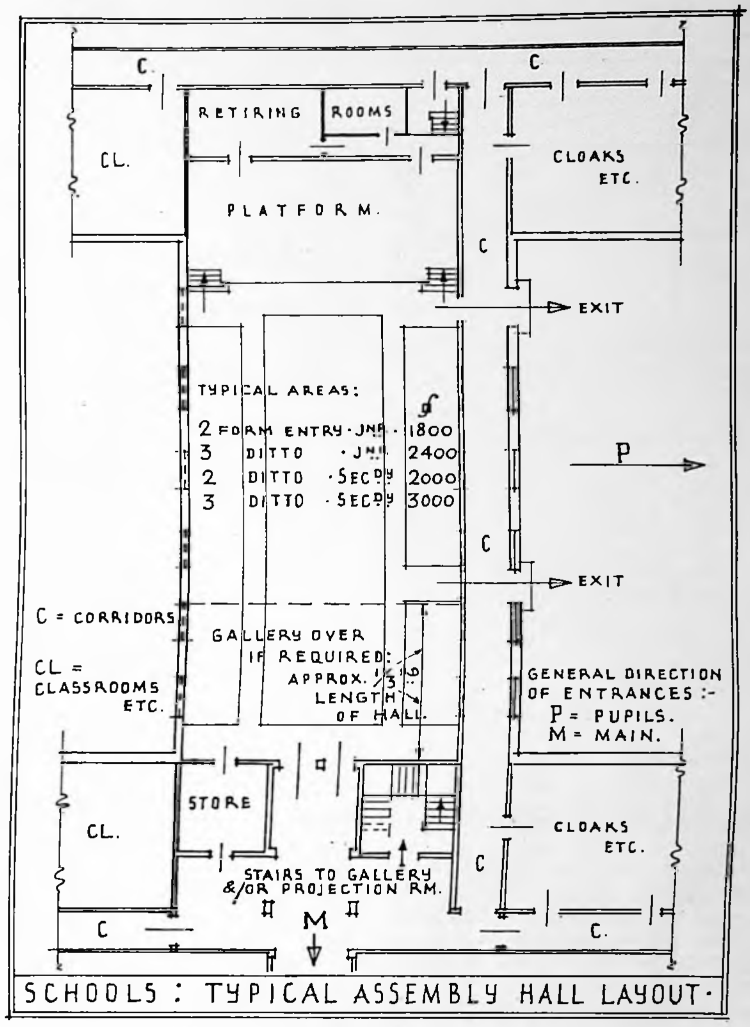


Figure 60

hall, unless each has only small numbers, when one hall will suffice if planned conveniently for both departments.

In Primary Schools, assembly halls should have an area of 1,800 sq. ft. ; this needs to be increased to 2,400 sq. ft. in the case of three-form entry schools for the older age groups ; for schools with three classes or less, the areas may be reduced proportionately. In Secondary Schools the areas are rather greater ; for two-form entry, 2,000 sq. ft. and for three-form entry, 3,000 sq. ft., which is equivalent approximately to 6 sq. ft. per pupil.

Seating in halls is generally most satisfactory when some form of stacking or nesting chairs are used. If the room is to cater for outside purposes and is, in consequence, to be licensed for music and dancing, it is necessary that the chairs can be battened together in banks of not less than four, and in very large halls it may be necessary to provide floor fixing for the seats adjoining gangways. A gallery is often provided and allows an increase in seating capacity without a proportionate increase in main floor area. By combining in a single block some of the other larger room, of a school, such as the dining rooms with the hall, great advantages can often be obtained from such combined accommodation.

Figure 60 illustrates a typical hall lay-out which has a main entrance directly in front of the main entrance to the building, and the corridor is widened to provide a crush space. Staircases to galleries and to projection rooms should not deliver into the hall itself, nor should they be so placed as to cause confusion in the main traffic ways. A corridor is placed on one side to provide covered access from back to front of the hall and as part of the main circulation of the hall ; emergency exits from the hall deliver into this corridor, one of which should be near the stage.

Acoustics are very important, both for the speaking voice and for music and singing. The shape of the hall is consequently of basic importance and long narrow rooms should be avoided ; for good acoustics the hall should not exceed 30 ft in height and heights of 20 to 22 ft will usually be found to be adequate ; it is desirable that consultation with an acoustical authority

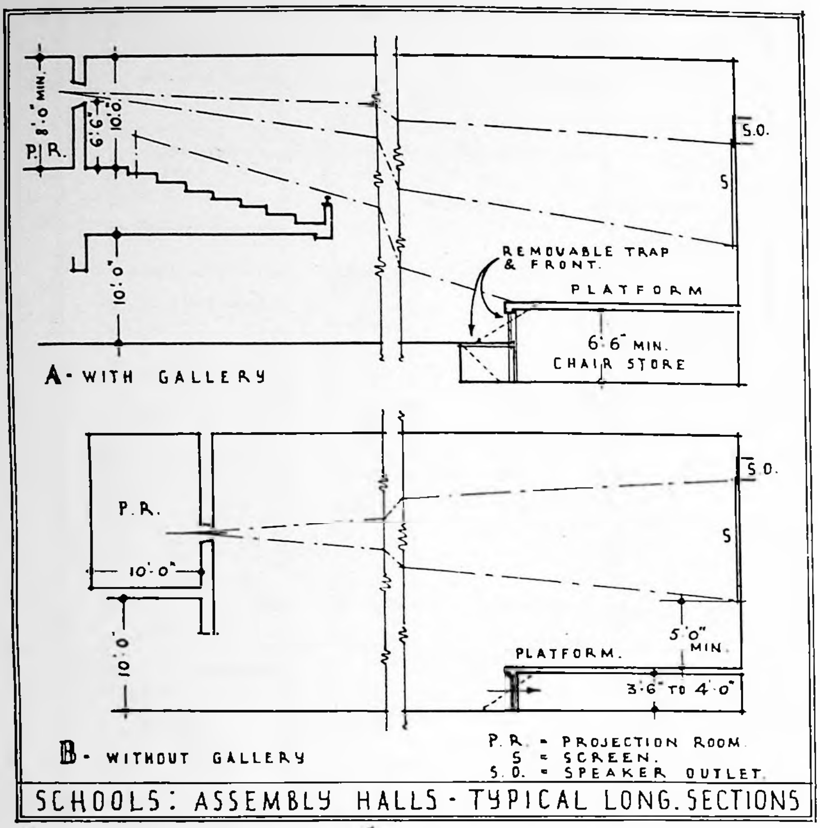


Figure 61

takes place in the early stages of the design of any hall which exceeds 50,000 cu. ft. Good ventilation is very necessary and should be by means of windows which should extend as near to the ceiling as possible. Facilities for the easy darkening of the hall are essential. Adequate entrances and exits are also important, especially the latter in order that the room may be cleared rapidly. The floors of all halls should be level to permit of activities such as dancing, but the gallery floors may be stepped to provide better vision. Figure 61 illustrates two typical sections through halls, the heights are greatly influenced by whether or not a gallery has to be provided. It is desirable that there is a minimum height of 10 ft between the floor of the hall and the under-side of gallery to ensure adequate vision of the stage and any projection screen provided. It is also desirable that there should be 10 ft head-room between the top level of the gallery and the ceiling of the hall. Lantern or cinematograph projection also has a bearing on the heights of halls, as it is essential that the lower edge of the screen should be not less than 5 ft above platform level to avoid interruption of the view if people are seated on the platform, or if there is furniture standing on it. It is also essential that the aperture between the projection room and the hall is placed at such a height that the beam is not interrupted should people be walking about in the hall or gallery. The projection room should be at least 8 ft high and it is desirable that it should have a width of 10 ft ; an area of at least 100 sq. ft. should be provided for the projection room. It is essential that the lines of vision be carefully worked out for all the seating in halls, particularly in regard to the cinematograph screen. Very wide halls are undesirable as the angle from the outer seats tends to become most unsatisfactory. It is desirable that any speaker outlet forming part of the projection apparatus should be placed close to the screen and a position above and in the centre of the screen is likely to be the most satisfactory. If an amplifier system is installed to assist speakers on the platform, the speaker outlets used in conjunction with it should be so placed that the volume is evenly distributed over the whole floor area. It is essential in all new schools that an installation for the dissemination of broadcast reception is installed and that provision is made for cinematographic projection. Care must be taken in the planning of the projection room to provide the usual safety precautions, as it is possible that films other than of the safety type may be used in such buildings. The planning and equipment of a projection room suitable for schools does not, however, usually involve great difficulties.

If possible the assembly hall should not be used as a passage-room ; approaches and exits are better if under cover, but direct access to the open air opposite emergency exits should be provided as shown in Figure 60. Artificial lighting needs special attention in order to provide an even intensity of 8 f.c. over the whole area.

Ceilings of halls are best flat or shaped as shown in Figure 62, Diagrams C and D ; if curved the centre of curvature should not be at or slightly above floor level but well below. The various sections shown on Figure 62 also indicate the varying window heights (and consequent amounts of light) for each type. Half of each section, Diagrams A, C and E, show corridors adjoining the hall. Types A to F are of satisfactory sections for good acoustics, but G and H should be avoided. A dado 8 ft high is shown round the walls and should be of wood or plywood panelling to reinforce the voices of speakers ; this panelling area should be cut up as little as possible by doors, while windows are better kept above the 8 ft level. In each diagram the maximum ceiling height has been made 30 ft above the floor level, so that it will be noted that a flat ceiling permits the maximum of window area but results in a building with a greater total height.

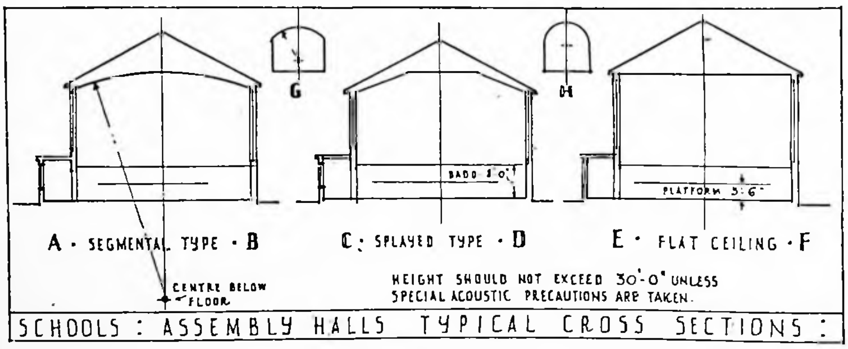


Figure 62

Platform—A platform or stage is required in all halls. Some schools provide only a small platform for speakers, in which case it should not be less than 7 ft wide in order to have space to pass behind persons seated at a table. It is desirable, however, that greater depths should be provided in order to allow space for play-acting. The stage should be considered as additional space to the area prescribed for the hall. The platform

should be the full width of the hall and not less than 20 ft deep which, with a temporary proscenium, allows ample space for a play-acting area 20 ft by 17 ft. Platforms are usually about 3 ft 6 in high above the general floor level. A fixed proscenium is not necessary and curtains may be used for the purpose.

The most suitable floor for halls is hardwood strip or wood block. Hard plasters should be avoided on walls as these are acoustically bad and reverberation may be reduced by the use of lime plaster without a finishing coat of distemper for ceiling and walls above the dais, and by covering the wall behind the audience with absorbent material. The carpeting of the floor of the gallery and the platform may also be helpful.

An important consideration is that of storage of furniture so that the hall area may be cleared of chairs when necessary. Storage should be ample in capacity and readily available ; it is frequently found convenient to form a storage space under the platform with access through the stage front. Figure 61 illustrates how this store may be provided under the platform. It is desirable that a clear headroom of 6 ft 6 in is provided, otherwise the handling of furniture becomes difficult. It is also desirable that access is not confined to a small opening in the front of the platform, but that a portion of the floor be also made removable. If access through the front only is provided, it will be found extremely difficult to clear large pieces of furniture, such as tables, into the store.

One room, or better, two rooms should be available for use as dressing rooms for the hall stage ; a room or space which can be used as a " green room " is also very helpful. Changing rooms attached to the gymnasium can sometimes be planned for use as dressing rooms for the hall. Where the platform is likely to be used for dramatic performances, a simple system of stage lighting is essential ; this should comprise footlights, and two or three suspended top-battens together with one or two flood-lights fixed in the hall itself. The lights should be capable of being dimmed, and full control of the stage and hall lighting should be available on or near the platform itself.

School Meals—The Regulations require the provision of kitchen units in all schools and the Schedules of Accommodation require the provision of rooms for meal service for every Primary School having seven or more classes and for all Secondary Schools ; in small Primary Schools and in Nursery Schools the meals are often served in classrooms.

At the moment all buildings and equipment for the school meal services are provided by the Ministry of Education in conjunction with the Ministry of Works, but it seems probable that there will be changes in this policy when the supply position becomes easier and when new permanent school buildings are being erected in which the dining-rooms and kitchens form a part. The Memorandum on the Building Regulations gives a very considerable amount of information regarding Kitchen and Dining-Room Planning and Equipment in Appendix 3 ; this document refers to the standard plans in use for the war-time programme of the school meal service, and suggests that general lay-outs and particularly the amount of equipment, can be adapted from present schemes, based on prefabricated huts, to suit permanent buildings. The Memorandum points out that broadly there are three types of kitchen ; firstly, central kitchens supplying meals to a number of schools in one area, the distribution being by means of insulated containers ; secondly, kitchens on the same site but separated from the dining accommodation, which is a type of lay-out to be avoided at all costs in permanent building ; thirdly, kitchens with direct access to the dining-room through a servery ; the last arrangement is probably the most satisfactory and it is probable that it is cheaper to operate than the first unless there are a number of schools in a relatively small area.

It is suggested that dining-rooms are based on 8 sq. ft. per person for Primary Schools and 9 sq. ft. per person in Secondary Schools. The Building Regulations suggest the provision of a dining-room area based on 65 per cent of the school population divided into not more than two sittings ; it seems likely, however, that there will be a gradual extension of the school meal service and that areas based on numbers up to 100 per cent of the pupils may be needed, again divided into not more than two sittings. The Memorandum already referred to gives detailed information as to the overall areas of kitchens and of the areas of ancillary rooms needed to serve varying numbers of meals. Dining-rooms should be light, warm and well ventilated, of the simplest nature with all surfaces, especially the floor, designed for easy cleaning. Tables should be not less than 2 ft 6 in and preferably 3 ft wide ; each pupil should be allowed at least 1 ft 9 in and preferably 2 ft run of table. Gangways between tables should allow not less than 4 ft, but 5 ft is much more satisfactory, particularly if the longer type of table is used. Main gangways should not be less than 3 ft in the clear between seating and preferably more ; tables seating more than four people on each side are difficult of access unless adequate gangway space is provided. Figure 63 illustrates the general relationship of dining-rooms to service space and kitchen in Diagram A and Diagram B illustrates typical spacing for chairs and tables. Benches are more economical in seating space than chairs, but their use would appear to be undesirable. The lay-out of tables should be related to easy traffic in and out of the servery. When self-service is adopted, as is becoming general, it is important to provide adequate lengths of counter and adequate circulation space adjoining the counter in which queues can stand without interrupting the general flow of traffic.

The kitchen should, if possible, be on the same level as the dining-room and have direct communication with it. Care should be taken to prevent cooking smells entering the main school building. Access for deliveries of supplies must be so arranged that vehicles can be unloaded at the service entrance to the kitchen. The larders and storerooms should have northern or eastern aspect and, if possible, the kitchen should be similarly situated ; good light in the latter should be obtained by means of units high in the walls, leaving clear the lower part of the walls for apparatus ; top-light should be provided, especially if the kitchen approximates to a square on plan. The size of the kitchen is entirely

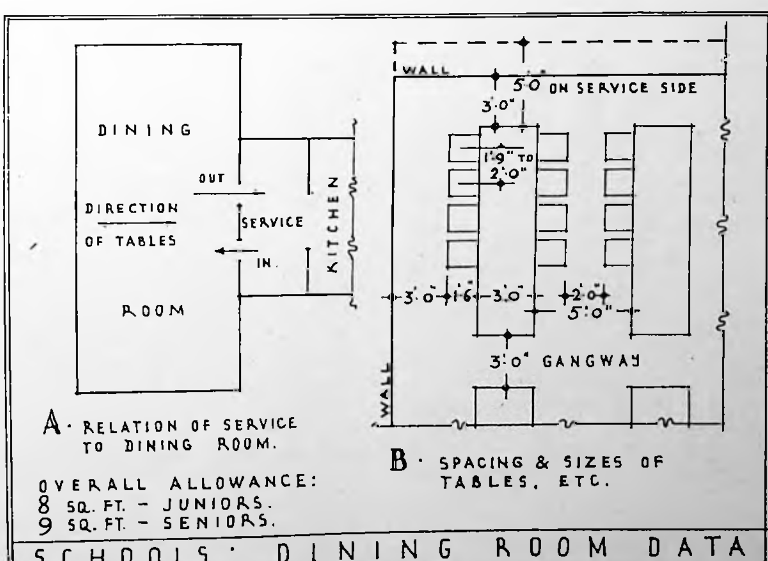


Figure 63

dependent on the numbers to be catered for and is slightly influenced by whether service of other than mid-day meals is required. Ample hot water and steam are needed, and the kitchen should be thoroughly equipped to save all possible time and labour. Larger kitchens require a staff room and, except in the smallest kitchen, separate cloakroom, lavatory and W.C. accommodation should be provided for the kitchen staff.

Gymnasium—The Building Regulations do not call for a special gymnasium in connection with Primary Schools ; it is assumed therefore that physical training under cover will be undertaken in the assembly hall.

A properly planned and equipped gymnasium is required in all Secondary Schools ; except that it may be combined with the assembly hall in one-form entry schools. In the one-form entry size, the room requires the minimum area of 1,800 sq. ft., but in all other schools the area is now required to be 2,800 sq. ft., which is a considerable increase on past practice. In the past the normal or standard size has been 60 ft long by 30 ft wide, whereas the new requirements indicate a room 70 ft long by 40 ft wide. The height should be not less than 18 ft. The room is often separated from the main school building because of noise and to permit of lighter and cheaper construction. If the building is separate a covered connecting way to the school is often considered necessary. In view of the new regulations, except in very special cases, the gymnasium should not be used for any purpose other than for physical training. Aspect is frequently not considered, but it is very advantageous if one long wall can be opened towards the south for a considerable part of its length, with suitable doors and a space for open-air exercise adjacent, though it may be difficult to accommodate enough wall bars on the remaining walls. Any such arrangement will necessitate a redistribution of wall bars and a different lay-out from that shown on Figure 64. The gymnasium should be on the ground floor and if suitably planned its changing rooms may be used also in connection with the playing fields. The size and equipment of the gymnasium is based on classes not exceeding thirty pupils. It is desirable that gymnasia have flat ceilings with window heads placed as near to the ceiling as possible. Good lighting and cross ventilation are essential ; windows are best kept above the wall bar apparatus height, which are 9 ft 2 in overall, but as this is difficult to achieve it is usually necessary for the wall bars to pass in front of the lower parts of the windows. Sometimes windows are installed with sill levels at about 3 ft above the floor and are covered by the major part of the apparatus. Adequate space between windows is required to provide fixings for large apparatus, such as beams, but apart from this the windows should be as continuous as possible on the two long walls. Centre-hung casement-type windows are probably the most satisfactory, as they open for the full amount of their area. Roof lights are undesirable and complicate the fixing of apparatus. Care should be taken to plan the necessary metal work and to arrange for the fixings of apparatus during the erection of the building. Window ladders are generally provided on one end wall and as two units are desirable it is better if these are separated by about 3 ft to allow for the fixing of goals for basket ball on the centre line of the room.

Artificial light should provide a good diffused light of 8 f.c. intensity at floor level, and the lamps should be placed close against the ceiling and should have wire guards, so that ball games may be played without danger. It may even be possible to recess the lighting so that it is flush with the ceiling.

Galleries for spectators are not generally necessary, but if provided should not connect directly with the gymnasium, but have an approach staircase from a lobby or corridor, preferably near the entrance to the gymnasium.

A most important feature of construction is the floor, which can almost be regarded as a part of the apparatus ; it should be constructed of boards of close-grained hardwood, free from knots, in narrow widths to avoid shrinkage and laid across the gymnasium and not longitudinally ; boarding should be laid on joists to increase resiliance. Maple has often been used, but there is a tendency for this to become excessively slippery.

The walls of gymnasia are best finished with smooth plaster, but it is an advantage to have acoustic plaster or other sound-absorbing material on the ceiling to reduce noise. Stanchions or piers are more satisfactory if placed outside the room to avoid breaks on internal wall surfaces which are required for the apparatus.

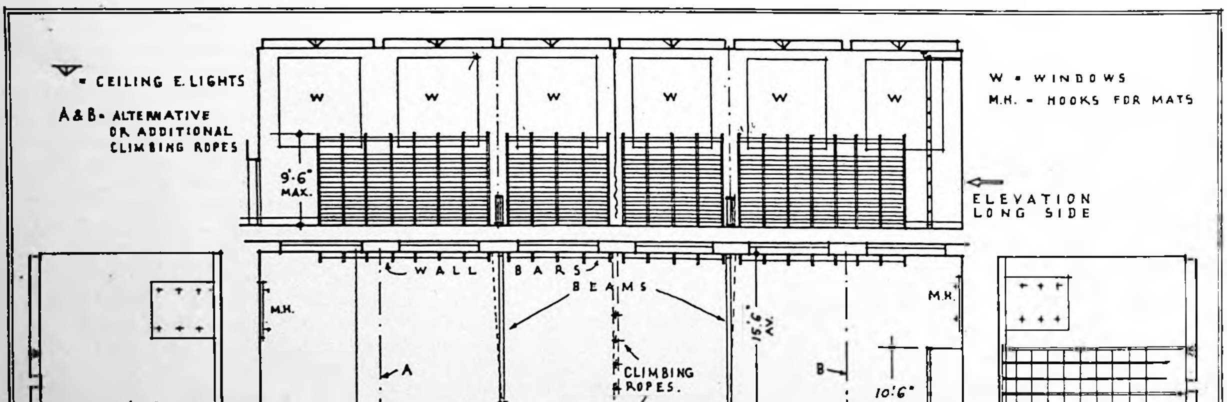


Figure 64

Heating (not open fires or stoves) is required to maintain a temperature of 55° F; radiators should be placed in recesses in the wall if possible.

Gymnastic Apparatus—The following apparatus is usually provided for a normal class of thirty pupils:

Fixed Apparatus—32 wall bars, 4 single-span double-beams, 2 vertical window ladders, each six squares wide (approximately 10 ft), 20 climbing ropes.

Movable Apparatus—8 beam saddles, 10 balancing benches, 2 jumping stands, one vaulting horse, one vaulting buck, 4 mats, one agility mattress, one beating board.

Shelves are required for the beam saddles, racks for apparatus such as clubs, boxing gloves, foils, single sticks, and hooks for the suspension of mattresses.

The apparatus generally has been fairly well standardised by various manufacturers in accordance with the recommendations of the Ministry of Education and therefore the sizes and shapes are outside the scope of "over-all" planning, except in the case of fixed apparatus.

Wall bars are generally placed at 2 ft 9 in centre to centre of vertical supports; beams may be single or double span, although single are the only type possible in the wider gymnasia; the beams should not be less than 13 ft long, nor should they exceed 15 ft 6 in long. Figure 64 indicates the general spacing and positions of apparatus for a typical gymnasium.

A large apparatus store is essential adjoining all gymnasia. An area of approximately 180 sq. ft. is desirable and the minimum dimension should be not less than 10 ft. This store should have as wide an opening to the gymnasium as possible; a roller shutter should be used, rather than the normal large types of doors, to avoid occupying useful floor space. A room for the instructor is essential; in it some storage space for smaller apparatus should be arranged; it should act as a changing room and be fitted with a shower bath and lavatory basin.

Changing Rooms—All gymnasia must be provided with separate changing rooms and shower baths; duplicate changing rooms are required if both sexes use the same gymnasium. It is advantageous if the same changing rooms can be used for both gymnasium and playing fields. In many schemes it may be found convenient to provide changing rooms for each sex at opposite ends of the gymnasium; the rooms may form a small suite with the gym kit store, instructor's room and shower baths. The actual changing room should have an area of not less than 336 sq. ft.; the shower compartment should have an area of about 240 sq. ft., subdivided into space for the showers and for drying. It is desirable that there is direct access into the changing rooms without entering the gymnasium itself, but direct access from the changing room to the gymnasium is necessary after pupils have changed, as is shown on Figure 65. The shower bath compartment should be so planned as to provide a continuous circulation. For boys' schools, and also for many girls' schools, the "run-through" type of shower bath, without partitions, is generally provided, but in some girls' schools, and occasionally in boys' schools, individual shower-compartments are called for; these individual shower-compartments may be formed either by curtains or by the use of fixed partitions. Shower outlet nozzles in the "run-through" type should be placed, not less than 2 ft 6 in apart, and 3 ft is usual; the width of the shower space is usually about 4 ft and the drying space should not be less than 4 ft and preferably much more. The wall dividing the showers from the drying space should be at least 6 ft high. A foot bath or trough is often installed at the approach to the range of showers; foot baths are often formed by placing large domestic deep sinks on the floor with seating arranged on each side. When partitions are adopted they should be based on running lengths of 3 ft and a front to back depth of at least 2 ft 9 in, and better 3 ft. The gangway space between individual showers, on either side of a room, should not be less than 3 ft and a greater width is desirable. For convenience of plumbing shower outlets are usually placed on the back walls of the partitions, but it is better where fixed divisions are used if the nozzle is placed on the division and is directed diagonally towards the back wall against which the floor channel is usually placed. When partitions are used the problem of keeping towels, etc., dry during use of the shower is somewhat difficult and numerous schemes have been devised of which the most satisfactory appears to be that in which the towel is placed behind a hinged flap hung on the division and closing across one corner of the compartment.

The flow of water may be controlled either by a master valve or individual controls; the former is usual for "run-through" types and the latter where partitions are used; both types, however, require efficient thermostatic control and mixing should be provided so that there is only one source of delivery with water at a controlled and agreed temperature.

Figure 65 illustrates a typical changing room lay-out and stresses desirable circulation. Pupils enter the gymnasium block and pass into a clothing store, collect gym kit and proceed to the changing room. The changing room is usually equipped with clothes pegs and seats, under which are placed shoe-racks generally similar to those used in cloakrooms, but the provision of at least one hanger per pupil is desirable in addition to pegs. On returning from the gymnasium, pupils enter the changing room, remove clothing and in passing to the shower room pick up a towel from the clean towel store; pupils then circulate through the shower and after drying towels are given up through a hatch before pupils re-enter the changing room. The materials of wall and floor finishes should be carefully selected for shower rooms to meet conditions of continual dampness.

The method of dealing with towels usually has a considerable bearing on the lay-out of the changing rooms and shower compartments. Undoubtedly the most satisfactory practice is to issue a clean towel to each child on entering the changing room or during passage from the changing room to the showers and to collect it for laundering after use. This avoids the necessity of storage and drying of individual towels for each pupil—a practice which requires considerable space if it is to be done adequately and hygienically. The alternative

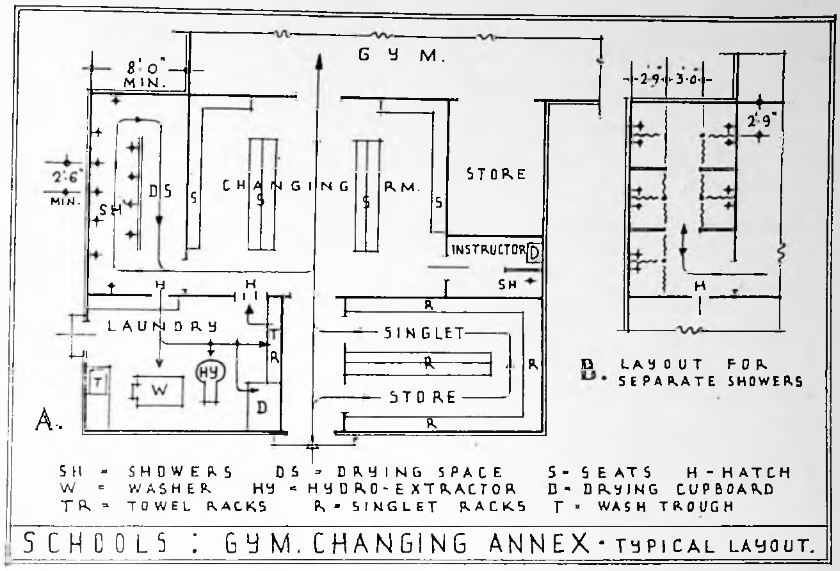


Figure 65

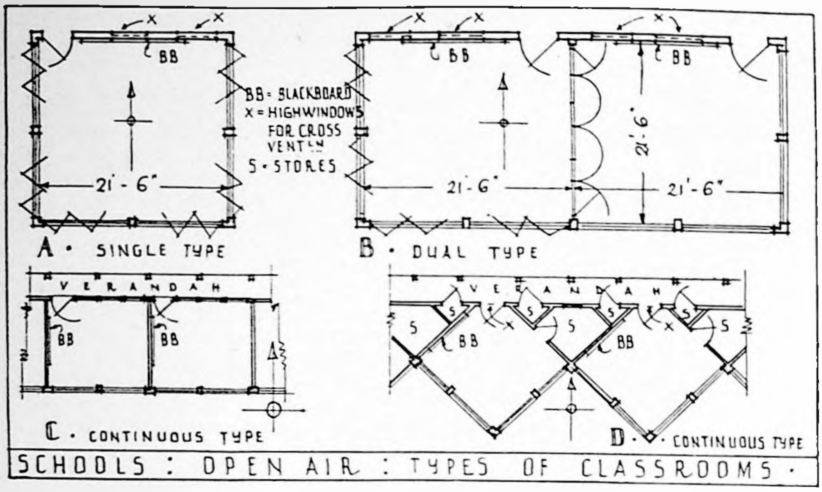


Figure 66

practice, whereby pupils bring their own towels to and from home, may involve carrying a wet towel in the pupil's satchel or bag for a large portion of the day, which would appear to be most unsatisfactory. If the first scheme suggested is adopted, a small laundry unit can be added conveniently, as shown in Figure 65, to one of the changing-rooms; the apparatus for such a room could normally be installed in an area of approximately 150 sq. ft. It will be seen from Figure 65 that the equipment necessary for such a laundry is relatively small. When towels are issued, or alternatively, if each pupil retains its own towel, storage is necessary for each pupil's shorts, singlet and gym shoes; this storage may usually be provided conveniently in wire racks 8 in by 6 in by 12 in deep and it will be found that a floor area of approximately 150 sq. ft. is needed to accommodate the kit of 450 pupils. Heating pipes are required below these wire racks. Very good ventilation is essential in changing rooms and shower compartments, but it is equally important to maintain a temperature of 55° F in the coldest weather.

The instructor's room should be provided with a lavatory basin and an individual shower bath. It is desirable that some W.C. and/or urinal accommodation, is provided in close proximity to the changing rooms and in the gymnasium blocks.

Room for Medical Officer—Provision must be made in all schools for a room to be used for medical inspection and treatment of pupils. In all large schools the room should be allocated entirely for these purposes. It is desirable that the special room, or any room used for the purpose, should be at least 20 ft long in one direction for eye-testing. A small waiting room in connection with the medical inspection room should be provided. The rooms to be used for this purpose must be equipped with a lavatory basin having hot and cold water and W.C. in close proximity, good lighting and heating are essential, and the room should be capable of being darkened.

Staff Rooms—It is necessary to provide a staff common room in all schools, the minimum area of which should be 120 sq. ft., but the area should be based on an allowance of 30 sq. ft. for each member of the staff. If there is a considerable staff of both sexes separate rooms are sometimes asked for, but in any case separate cloakroom, washing and sanitary accommodation is necessary for each sex. The amount of sanitary equipment has already been given.

A special room for the head teacher is needed which should be centrally placed on the ground floor and planned in close proximity to the entrance used by visitors; a separate cloakroom and lavatory should be provided adjacent to the head teacher's room. Sometimes a small waiting room is provided adjoining the head teacher's room, and in large schools an office for clerical assistants is also provided, and this should adjoin, but not be approached directly from the head teacher's room. An alternative arrangement is to provide a large room which will serve the dual purpose of a secretary's office and a stationery store room. In mixed schools, in addition to the head master's room, a room must be provided for the senior woman assistant who will have charge of the girls and may wish to interview them or their parents in privacy.

Staff rooms should have a pleasant outlook and a sunny position where possible. Frequently staff rooms are placed in upper floors in a central position, and by such an arrangement it is often possible to provide a small suite of rooms in a quiet position for all but the head teacher's room. If school buildings are to be used for evening classes, a separate room is usually necessary for the teacher in charge of evening work. Some schools require a small kitchen adjoining the staff common room in which members of the staff may cook or heat food for use at times other than the midday meal when the school kitchen is in use.

Special Schools—Schools which fall into this group vary considerably; some types are almost normal school buildings, whereas others can be said to be allied to hospital planning, to meet peculiar physical requirements of children with widely divergent mental or physical defects. The size of classes are to be as directed by the Ministry of Education, and may vary from 10 to 30, according to the nature of the disability of the pupils. For deaf and partially deaf children, classes are limited to a maximum of 10; for children who are blind, partially blind and for maladjusted children the maximum class should not exceed 15 pupils; for the educationally sub-normal, epileptic or physically disabled, the maximum is 20 and for delicate children the maximum is 30. These maximum numbers are applicable to children of all school age-groups.

Site and playground areas have already been referred to in this series and reference back will show the slightly different requirements needed. The Regulations regarding cloakrooms, changing rooms, sanitary apartments, storage provisions and kitchen accommodation are the same as for normal schools. The Third Schedule of the Regulations sets out the accommodation to be provided for different types of pupil and in general these do not vary greatly from normal schools except for areas required and for the types of rooms selected as suitable for the health of children in each particular group.

Open-air Schools—For more delicate children "open-air" schools are sometimes built, but these should not be confused with "normal" schools constructed on "open-air" lines. Pupils in special types of open-air schools are those suffering from physical defects such as malnutrition, rickets and anaemia, while mentally defective children are sometimes accommodated in similar schools or in completely separate wings of the school. These schools usually provide for a small total number of pupils.

Sites should be chosen on the outskirts of towns but within easy reach of good means of transport, although in some areas special transport arrangements are made for the collection and return of children to and from their homes; in any case, such a service is essential for those pupils whose disabilities are too great to use public means of transport. In such schools, playgrounds and school gardens are of great importance, and consequently a level site should be chosen with, or be planned with, a good wind-shield of trees on the north and east sides, and even on all sides if the site requires it; south-east or south aspect is essential. Dining accommodation will generally need to provide for meals for the full 100 per cent of school numbers.

The schools frequently provide accommodation for both sexes. The main

accommodation may be divided under four heads: teaching, physical training, resting and dining, but each is interrelated with the others and the different parts of the building, although separated, must not be too independent of one another. Schools of this nature are usually of one story only.

Classrooms—The essential feature is to secure a maximum of light and air with facilities for protection from driving rain and cold winds. The size of classrooms should be not less than 480 sq. ft., and some advantage has been found in the use of approximately square rooms. Classrooms may either be detached with four sides capable of being opened as shown in Type A in Figure 66, or in a continuous range when two opposite sides only may be opened as in Type C of Figure 66. The former type are perhaps the most satisfactory, but a variation in which two classrooms are put together as a unit, as shown in Figure 66B, may be found to be more economical; if the latter arrangement is adopted and the two rooms are divided by a movable partition the whole may be converted into one large room if required. Detached classrooms are not necessarily the most costly, as light construction may be used; the method involves, however, considerable lengths of covered way as weather protection; connecting links are one of the greatest difficulties in "open-air" type plans, as it seems impossible to design a waterproof open-sided covered way and, therefore, the children have to walk from room to room on wet paving. Figure 66D illustrates an alternative form of a continuous type arranged to permit two walls to be opened and at the same time to avoid opening the cold aspect side, as is necessary in Type C; the arrangement gives greater flexibility in encountering driving rain. All the sides of the classroom must be capable of being closed either by glazed doors or screens with hopper-type fanlights above to ensure cross-ventilation in all weathers. Floors should be lifted about 12 in above the ground level and there should also be low thresholds or breast-walls above the floor level to protect the feet from draught and cold.

The heating of such classrooms presents a problem about which opinions vary considerably; it is true that all the usual methods of heating only raise the temperature of the room a few degrees, but the main purpose of providing heating in an open-air classroom is to ensure a drier atmosphere and so that in damp weather the room may be closed up and dried. Separate slow-combustion stoves have proved the best and most economic method of heating these rooms.

Rest Sheds—The provision of one or more rest sheds to accommodate all the pupils is essential for many categories of special schools; this provision may either take the form of a large space for the whole school or a series of spaces for groups or classes. The areas needed in rest sheds should provide at least 20 sq. ft. per child. It should be borne in mind that the older children require rest-beds of adult size, which is about 6 ft 6 in long by 2 ft wide. Rest sheds can usually be constructed as a simple light structure; they can also serve the purpose of covered play-space. Glazed screens are necessary to enclose the rest-space during inclement weather, and much advantage can be derived from a wide projection to the roof so as to avoid the need to close the screens in wet weather during the period when the beds are in use; such an overhang needs to project 6 to 8 ft from the end of the front row of beds, according to the height of the roof above the floor. The floors of rest-spaces should be raised at least one and preferably two steps above the surrounding ground. It is important that adjoining every rest-shed there should be ample storage accommodation for rest-beds and blankets; this storage must be adequately heated and ventilated to ensure the dryness of the bedding. Figure 67 illustrates a typical lay-out of a rest-space, based on using the smaller size of bed, 4 ft 6 in long; main gangway spaces should not be less than 3 ft wide and beds should be at least 12 in apart. The figure shows the front row of beds in a fine-weather position under the overhang of the roof; these could not be used in wet weather. An access path at least 4 ft wide is desirable across the front of the rest-space and should be of a hard material with a fall away from the shed itself.

Medical Room—In schools for delicate or physically disabled pupils, a large medical room is essential, as some regular remedial treatment may be needed for a number of pupils; this accommodation is in two parts; firstly a medical inspection room, having an area of 200 sq. ft., which is enlarged to 300 sq. ft. in schools for delicate or disabled pupils; secondly, a physical training room, which takes the place of the gymnasium provided in schools for normal children; physical training rooms usually need an area of 1,500 sq. ft. and must be well lighted and ventilated. The apparatus and equipment varies very much, according to the nature of the disabilities to be treated in each school.

Sanitary Accommodation—Special care is required in the planning and fitting of sanitary accommodation, as the children spend the whole day at school and special emphasis is laid on personal hygiene. Ample accommodation is of great importance. It is general to provide shower-baths where there are delicate pupils and slipper-baths for physically handicapped pupils. As many of these schools provide for both sexes, except for young children, it is usually necessary to duplicate sanitary accommodation and in many schools it must be dispersed so as to be in close proximity to each room or section of the building; this applies especially if the children are physically handicapped; for some children provision may be needed for handling bedpans.

Boarding Schools—The new regulations set out, for the first time, the requirements for boarding accommodation in County, Voluntary and Special Schools. Up to the passing of the 1944 Education Act very little, if any, boarding accommodation was provided in State-assisted Schools, except in the case of Remand Homes and Homes for Orphans and similar special classes of children. Boarding schools are usually provided either by charitable organisations or as schools run privately as Preparatory and Public Schools.

The Regulations do not give a lead as to whether boarding accommodation should be grouped with teaching

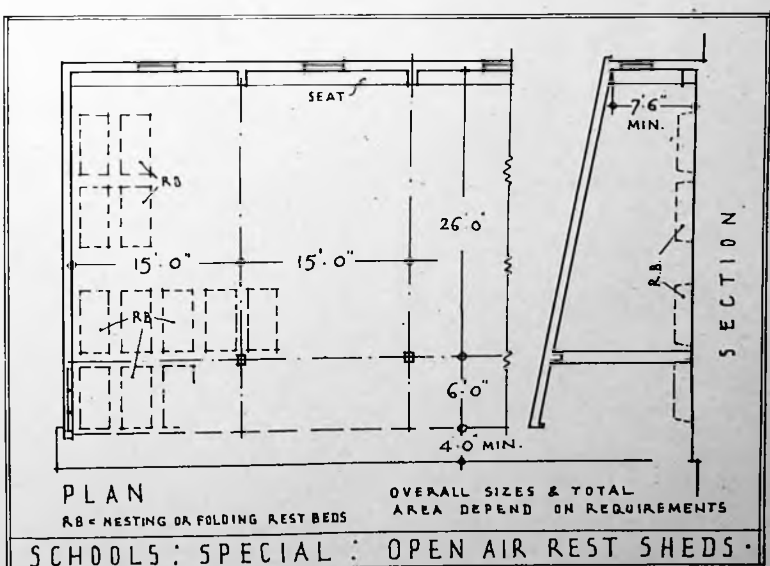


Figure 67

accommodation, or whether the boarding accommodation should be separate. Practice has, in the past, varied very considerably; some schools have had part of the boarding accommodation attached to teaching buildings and in some cases the whole has been very closely related, whereas in other plans this accommodation has been arranged in separate "houses" either on the same site or on sites completely separated from that providing teaching buildings and playgrounds.

Sites—The regulations require that where boarding accommodation is provided on the same site as the school, the area shall be increased by not less than half an acre for the first 50 boarders and by not less than an additional quarter-acre for every additional 50 boarders; where, however, boarding accommodation is provided on a separate site the area shall not be less than one acre for the first 50 boarders and shall be increased by not less than half an acre for every additional 50 boarders. It would appear that such site areas are not particularly generous and that in practice, in the past, it has been usual to provide greater areas. Even with such requirements the areas of sites are likely to amount to considerable totals, a fact which raises problems as to the relation of schools to towns and also the relation to the areas from which pupils are drawn; as no great daily demand needs to be placed on transport a site on the outskirts of a town would seem to be most suitable, although the selection should be made so that deliveries of supplies are not made difficult. Since pupils are likely to be drawn from a wide area the site should be near a town having a good transport system connecting easily with the area to be served. It would appear to be advantageous if a single site can be obtained which will be sufficient for the school, the boarding houses, the playing fields and for housing such of the staff who are not accommodated within the various school buildings themselves.

General Lay-out—The lay-out must of necessity vary considerably according to whether or not boarding accommodation is attached to teaching rooms. When the two types of accommodation form one group of buildings it is not unusual to devote the ground floor to teaching rooms, dining facilities and common rooms, with one or more floors over used for sleeping accommodation for pupils, staff and domestic staff. Where the boarding accommodation is in separate buildings, the ground floor of these buildings is generally devoted to daytime requirements and the upper floors to sleeping accommodation. The method of providing meals has great bearing on the lay-out and the planning as a whole; this may either take the form of a central dining-room block in which the whole school may be accommodated, and which also provides for the day pupils' midday meal. Alternatively, the facilities for meals may be provided in each of the separate boarding houses. The central organisation of dining-rooms would seem to be the most economical, but it most certainly calls for boarding houses to be in close proximity to the main school building. Such a method is, therefore, usual where boarding accommodation forms part of a single building, with teaching rooms, or where boarding houses are closely planned as in the types indicated on Figure 68. Separate arrangements for meals are usually adopted when boarding houses are on a separate site or sites or are planned on the same site but at considerable distances from the main building.

Figure 68 illustrates in diagrammatic form four basic types of boarding school plan based on the principle of placing the whole of the accommodation on one large site; an arrangement which seems to be the most satisfactory method for any complete scheme. There seems a possibility that some schemes may continue to be planned round the nucleus of an existing large house, although this can seldom provide a satisfactory scheme, as old buildings do not as a general rule lend themselves to the best plan arrangements.

Type A in Figure 68 has a central administration building containing the assembly hall, dining room and kitchen to which is attached the teaching rooms in two wings. Separated from the main block are the gymnasium and chapel, staff houses and the boarding houses. The boarding houses are grouped at the rear of the site in close relation to the dining hall; the boarding accommodation is based on the use of a number of units quite separate from one another. Boarding houses in such schemes vary in size considerably, some in the past providing for as few as 30, whereas others have provided for as many as 100; an economical unit-size appears to be between 50 and 70 pupils, a number which is convenient for a house-master or mistress to control, with the help of junior staff.

Type B is based on the boarding houses being planned as a number of units, but closely related or even attached to the main part of the buildings and are, in a sense, under the same roof and do not involve going out of doors to reach boarding accommodation. In this scheme the only really detached buildings are staff houses for married staff who are not house-masters, and staff such as porters, gardeners and the like.

Type C is somewhat similar to Type B, but the boarding houses are treated rather more as in Type A, being a number of quite separate units, but planned round a courtyard or "campus" and reached by covered ways or merely connecting paths. This scheme involves more roadway than that in Type A, but these roadways are kept away from the parts mostly used by the pupils and are at the backs of the houses; such a lay-out is likely to make for better and pleasanter grouping of the school buildings than Type A, and also at the same time is more open than Types B and D.

Type D is definitely based on the idea of one large building in which all the accommodation, both teaching and boarding, are approached from internal corridors; schemes such as this are usually designed to place teaching and all common rooms on the ground floor, with the sleeping accommodation on one or more upper floors.

The diagrams indicate the main lines of road or traffic circulations needed for each type of plan, together with the main approaches.

It should be noted that chapels, gymnasia and swimming baths, also in many instances workshops, are usually treated as separate buildings, planned either as independent units or units attached by covered ways, thus permitting the cutting off of buildings needing to be quiet from those which are the source of noise. The placing of the boiler house and laundry (when provided) is usually dictated by the size of the school; in large schemes they are often planned as independent units, so sited that smoke is blown away by the prevailing wind. It is not unusual to find in large schemes a group of buildings comprising the boiler house, laundry, a covered swimming pool, so that the largest heat-users are placed near the source of heat. A small maintenance workshop is usually attached to the boiler house where staff can carry out running repairs; sometimes such a unit is allied to the pupils' workshops, especially in boys' schools. In smaller schemes, the boiler house is often placed near the kitchen, which is also a large consumer of heat.

Main School Buildings—The main building usually contains the assembly hall, teaching rooms, and accommodation for the more important staff. The planning of the hall and the classrooms follow exactly that already outlined for day schools, except that there may need to be some changes in cloakroom accommodation, as will be discussed later. The hall should be planned, as in day schools, in good relation to main entrance, pupils' entrance and to classrooms.

Entrances—There is generally a main entrance which leads directly to the assembly hall and to the administrative parts of the school; it should also give easy access to the head teacher's accommodation, unless this is provided for a married man and his family, when separate access is needed, although there must be an easy connection from the main part of the school to the head teacher's office or study. Separate entrances should be provided for pupils leading directly to cloakrooms; these entrances should be closely related to the circulation from boarding houses to classrooms,

especially when the houses are separated from the main school building. It is desirable that vehicles should be able to drive up to the main entrance and to the head master's house entrance. The roadways previously referred to must give vehicular delivery access to boarding houses and to the kitchen and boiler house.

Dining Room—No specific requirements are laid down in the Regulations for these rooms or for the kitchens to serve them, but the information given in Appendix 3 of the Memorandum accompanying the Regulations is a useful guide. It should, however, be borne in mind that somewhat larger areas are desirable in boarding schools than for day schools, as all meals have to be provided instead of a single midday meal ; this factor is of importance, especially with regard to staff accommodation and storage. It is also desirable that the floor area provides for all pupils to eat at one sitting, and that some if not all of the teaching staff will be present at some meals.

Classrooms—The requirements for these rooms are the same as for day schools, and therefore the information already given will apply equally. It is important, however, that classrooms and boarding accommodation should each be self-contained and not in any way intermingled.

Library—This room is likely to assume greater importance in boarding schools than in day schools and should therefore be more spacious than those provided for children who may have access to public libraries and books in their own homes. The Library should be planned in closer association with the common rooms than with teaching rooms and should be treated as a room in which quiet is generally more possible than can normally be expected in common rooms.

Gymnasium—This room is also similar to that required in day schools, excepting that in some circumstances it is possible to eliminate changing rooms and to rely on the changing rooms provided for other purposes, such as outdoor games ; this can generally only be arranged where the boarding houses are planned to form part of the main school buildings.

Cloak Rooms—The amount of cloak room accommodation to be provided is similar to that required for day schools, but its arrangement is dependent on the type of lay-out adopted for the school. If the boarding accommodation is separate from the school buildings and the cental dining hall, it is essential that the cloakrooms are near the entrances leading to the dining hall, as pupils will frequently be coming to the main buildings for meals only and therefore a convenient position for leaving outdoor clothing is of importance in winter and inclement weather. If no central dining hall is provided and in buildings in which boarding and teaching accommodation are both approached from internal circulations, the cloakrooms should be near the pupils' entrance of the main buildings ; in the latter case these cloakrooms may also serve as games changing rooms as discussed later.

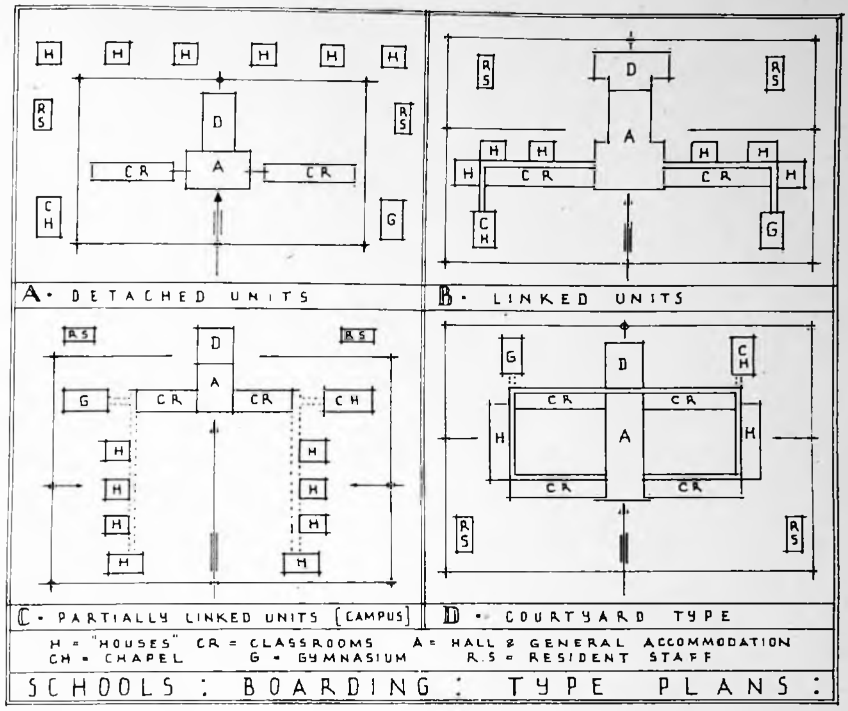


Figure 68

Sanitary Provisions—Basins and W.C.s should normally be linked with cloakrooms. The amount of equipment is generally similar to that needed for day schools, but rather more appliances are necessary, as both day and night use has to be allowed for, pupils being in the buildings continuously.

The Regulations give the following requirements for various types of appliance :

Baths (slipper) : One for every 5 girls ; one for every 30 boys.
Shower Baths : One for every 5 boys.
Basins : One for every 3 boys or girls.
W.C.s : One for every 5 girls ; one for every 10 boys.
Urinals : One stall for every 10 boys.

It should be noted that shower baths are the main provision for boys and, except when they are used only after games or gymnasium, they should not be of the "run-through" types, as is now general in day schools ; it is better to provide individual showers generally with trays, as full washing facilities have to be possible ; a suitable arrangement is to provide a row of shower trays 3 ft by 3 ft about 12 to 24 in apart against a wall and draining into channels which should also drain the floor of the room ; by placing the trays a little apart seats can be formed between pairs of trays for users to wash feet and legs.

Sanitary equipment must be distributed between day uses and the dormitories ; although the amount required near sleeping accommodation is not great in regard to W.C.s, there is usually a comparatively large number of basins needed. Some schools do not provide any baths for the pupils near the dormitories, but locate the whole complement together with cloakrooms and changing rooms, as pupils do not necessarily bath on going to bed or getting up in the morning ; such an arrangement permits the full number to be available after games, when many require baths at the same time. If boarding houses are separate from the main school buildings it is probable that there will need to be some duplication of sanitary provisions, as the school will require the usual numbers of fittings provided for a day school and the boarding houses will need the accommodation mentioned above.

Chapel—It is usual to provide a private chapel, often of a non-denominational character, to avoid pupils having to attend outside religious buildings during term-time. Seating must be provided for the whole of the school pupils, the teaching staff and for a number of visitors.

Swimming Bath—In larger schools a swimming pool is often provided to avoid the necessity of pupils having to go distances to public baths ; these baths are often of the covered type, and when not in use as a bath in the winter additional covered games or recreational space may be provided by temporarily flooring over the pool ;

this subject is fully discussed in the section on "Covered Baths;" on the other hand the pool is often of a small size and the changing facilities of the simplest character.

Staff Residences—It is often necessary to provide housing for members of the teaching staff, apart from those housed in the boarding houses, especially married masters, porters, groundsmen and engineers. These houses are usually grouped together on various parts of the site, but often having separate access to surrounding roads. The houses should be of normal types to suit the incomes of occupants, and should be provided with their own gardens. Unmarried staff, both teaching and domestic, are usually housed in the boarding houses although some of the former may wish to live out. A staff common room or rooms is usually provided in the main school building.

Staff Garages—It is desirable to provide a group of lock-up garages for the use of resident teaching staff, and also facilities for the daytime parking of the cars of visiting teachers and medical staff. The garages should be sited in an unobtrusive but convenient position on the site.

Provision for Games—As already suggested, it is desirable to provide playing field facilities on the site of the main buildings. A pavilion is usually required adjoining the most important pitches, and it should make provision for visiting teams to change, and in some cases for refreshment service of both school teams and their visitors. Provision is sometimes needed for further games, such as squash, rackets and fives and these may call for special buildings, which should be grouped and planned in an orderly manner, with due economy in respect of changing accommodation and the main circulations of the site.

Boarding Accommodation—Figure 69 shows in diagrammatic form an analysis of the boarding "house" planned as a separate unit attached to or wholly separate from teaching accommodation. The accommodation roughly divides itself into that used by day and that used for night, and this, in fact, also indicates the rooms which can be planned on the ground floor, the remainder being planned on one or more upper floors.

The main entrance to a house block should provide access for visitors and staff and to the house-master's or mistress's rooms and to the matron's suite; a separate entrance is needed for the pupils, with their cloakrooms adjoining. Each "house" thus has to provide accommodation for three groups of persons, teaching staff, pupils and domestic staff, for whom the matron is generally responsible. The house-master's or house-mistress's accommodation may be merely a suite of rooms or a ground floor study and first-floor bedroom with bathroom attached, or alternatively it may be a complete and somewhat cut-off house, if it is for a married man, although direct intercommunication is essential. Some accommodation may be needed for assistant staff, comprising study, possibly a common room and bedrooms, or alternatively study-bedrooms and a common room, together with bathrooms and sanitary accommodation. Teaching staff bedrooms should not be less than 100 sq. ft. and study bedrooms not less than 120 sq. ft.

The ground floor should provide pupils' common rooms and study-rooms and also the cloakroom and much of the sanitary provisions. The domestic staff, if housed in the boarding houses and not in a separate hostel, require a sitting-room and sanitary accommodation on the ground floor, to which must be added dining-rooms and kitchens if central dining-rooms are not provided. Domestic staff bedrooms are often provided on a separate upper floor from that occupied by teaching staff and pupils and should have their own sanitary requirements attached. The pupils' sleeping accommodation is usually provided on one or more upper floors; in many schools pupils are not allowed access to dormitories during daytime; thus the day and night accommodation are quite separately treated. Provision has to be made for storage of linen and clothing, together with sewing rooms for repairs.

Common Rooms—The Regulations require the provision of common rooms for pupils on the basis of not less than 25 sq. ft. per pupil, a requirement which is amplified in the Memorandum, which suggests that common rooms should not normally exceed 900 sq. ft. in size; this seems to indicate that a number of common rooms will be required in most "houses." Where boarding houses provide for both sexes, separate common rooms are required for each sex if the children are over eleven years of age, but for younger children joint common rooms are desirable. In any case separate common rooms should be provided for varying age groups within a school. Common rooms are best rectangular in shape, with windows on the long side. If prefects' common rooms are provided, as is desirable especially if individual study rooms are not provided, they should be based on 30 sq. ft. for each pupil, with a minimum area of 120 sq. ft. It is suggested that a quiet room or house library, separate from the common rooms, is desirable. A further recommendation in the Memorandum is that separate study rooms should be provided for the use of one or more pupils. It should be noted that the common rooms requirements under the Regulations are very large, and if these are amplified by the addition of a number of separate rooms, a very considerable floor area is needed; it has been the general practice in many schools in the past not to provide common room facilities for those pupils having single or separate studies, even when these are shared by as many as three pupils, but such an arrangement would not appear to comply with the requirements of the Regulations. In many schools individual lockers for storage of the pupil's personal property are provided in the common rooms, but

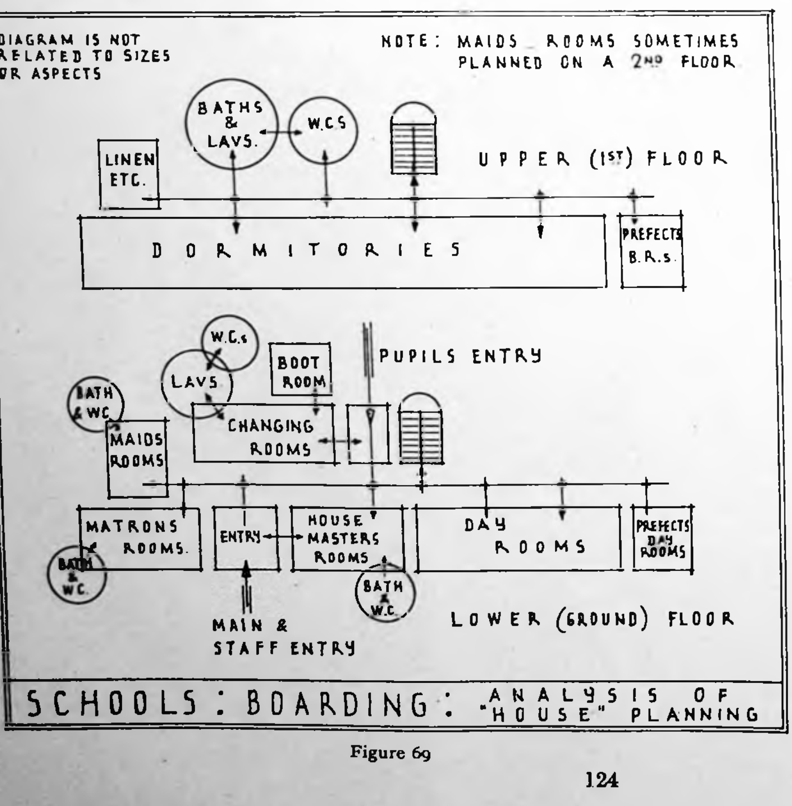


Figure 69

in other schools separate locker rooms apart from, but adjoining the common rooms, are preferred; lockers should provide a space of at least 18 in by 12 in by 12 in deep per pupil.

Study Rooms—The private study rooms, when provided, should be not less than 50 sq. ft. in area for one pupil, 80 sq. ft. for two, and 100 sq. ft. for three pupils; these areas are dependent on the shape of the room and should be such that each pupil is provided with an adequate writing surface having proper daylight. Each pupil requires a desk or writing surface, a desk chair, some bookshelf and cupboard space and, if possible, an additional chair; consideration should be given to building-in of the furniture as far as possible as a means of economising space. Each study should have its own window and heating facilities.

Dormitories and Cubicles—Opinion as to whether dormitories or cubicles should be provided vary considerably; in boys' schools open dormitories are very usual for, at least, the junior pupils; in many girls' schools, however, the sleeping area is often divided by screens or curtains forming cubicles within a large room. Cubicles are almost always provided for girls over twelve years, but in the formation of these cubicles the divisions are generally wooden screens and the entrance side closed only by curtains. The floor area required in dormitories is not less than 55 sq. ft. per pupil, with a requirement that there shall be not less than 3 ft between any two beds; where separate cubicles are provided each should have an area of at least 60 sq. ft. Beds are usually 2 ft 6 in wide. Cubicles need individual windows. Good cross-ventilation and good light are essential in dormitories, and the tops of windows must be not more than 9 in below ceiling level. It is recommended that the number of pupils in a dormitory should be kept small and in any case not exceed 20 and for children under the age of seven, the number should not exceed six. Small dormitories are also desirable for children in special schools. The Memorandum suggests that a number of single bedrooms of not less than 80 sq. ft. in area should be provided in the place of cubicles for the use of older boys and girls during the last year or two of their school life; such a provision tends to complicate considerably the planning of sleeping accommodation, since a number of similar rooms are necessary adjoining dormitories for the accommodation of supervisory staff. The method of providing for the storage of children's clothing varies greatly; for older children some drawer accommodation and some hanging space should be provided in each cubicle or adjoining each bed in dormitories, but for younger children it is usual to provide separate wardrobe rooms from which clothing is issued to the children, the control being in the hands of the staff.

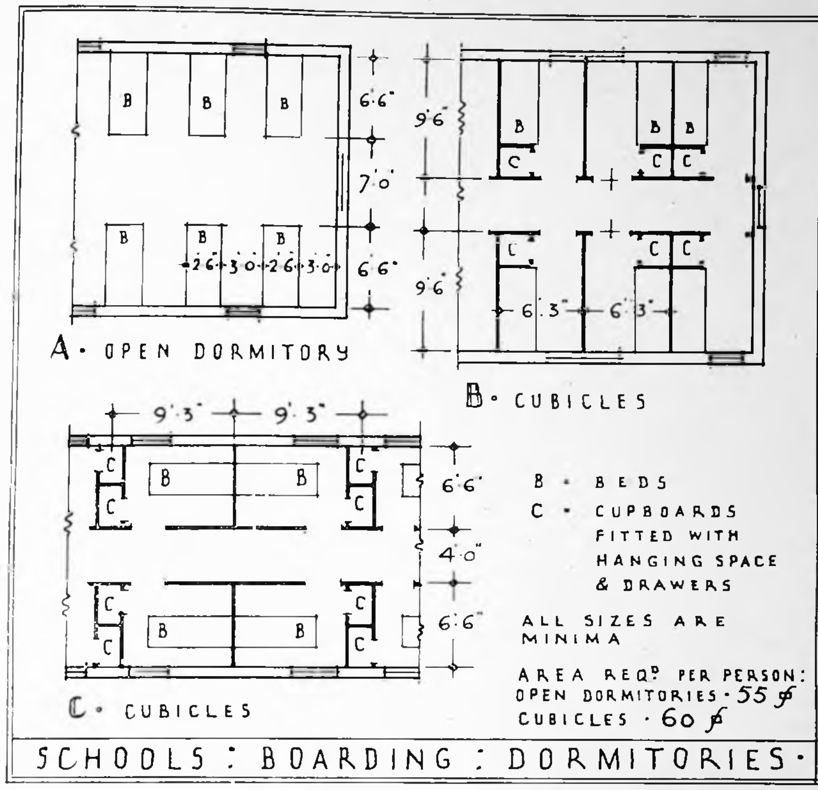


Figure 70

Figure 70 illustrates the spacing of typical dormitories and cubicles and the typical dimensions which arise from the minimum floor areas suggested; it will be noted that the dormitory as shown in Diagram A requires a span of 20 ft, and if cubicles are arranged as in Diagram C the same width is needed if the gangway is 5 ft, but this might be reduced to as little as 4 ft. In the Type B the width of the cubicle cannot satisfactorily be reduced to less than 6 ft 3 in if space for a chest of drawers is provided; the main objection to this lay-out is that the beds have to be placed with a long side against a wall or partition, which complicates bed-making. Type C requires a slightly less span but much greater length, but in order to keep the bed free on both sides and permit of a chest of drawers a greater width than 6 ft 6 in is desirable.

Cloakrooms—In boarding houses the cloakroom often has to serve also as the changing room for games and has therefore to provide facilities for hanging outdoor clothing, storage of games clothing, and boot-lockers. Many of the schemes adopted in the past have not been very satisfactory from the point of view of hygiene, as damp and frequently very dirty games clothing and even towels are stored in lockers. A better system appears to be the provision of a separate room for the outdoor clothing similar to that provided for day pupils, but based on the use of coat-hangers, especially for girls, and another room for changing; adjacent is then planned proper storage and drying facilities for games clothing and the bathing annexes. In some schools outdoor clothing is hung on pegs or hangers suspended from rods in a room or in corridors; boots and shoes are all kept in individual lockers in the boot-room and games clothing in lockers round the walls of the changing room; these lockers should be at least 12 in by 12 in by 4 ft 6 in high, placed well above the floor to permit heating pipes being placed below; they should be fitted with rods projecting from the back on which clothing may be hung separately, a towel-rail and shelves at the base for boots and shoes. The boot-room should be provided with some benching for boot-cleaning and it is desirable that a wash-basin is provided. The main groups of lavatories and W.C.s should be planned in conjunction with the changing room and/or cloakroom, together with any foot- and shower-baths needed for changing purposes.

Sanitary Accommodation—The number of appliances have already been given; it is necessary to disperse these appliances to meet all the needs of the school. W.C.s are needed in close proximity to the sleeping accommodation, but the numbers may be quite small and the bulk grouped together for day-time use. Washing facilities must be planned in close relation to the dormitories, but preferably in separate annexes; basins are needed at the rate of at least one to every four pupils in dormitories and groups

of cubicles, and one in every single bedroom. Basins are usually arranged in ranges for boys and young children, but for all older girls it is desirable that each basin is placed in a separate cubicle 3 ft wide and about 6 ft deep to insure privacy. Adequate supplies of hot and cold water are essential for all slipper- and shower-baths and for basins ; shower-baths should be fitted with efficient mixing-valves. Good light, both day and artificial, together with good cross-ventilation, are most essential.

Separate sanitary provisions should be provided for the staff, both teaching and domestic, in association with their bedrooms and their day-accommodation. Domestic staff bedrooms should comprise single rooms not less than 100 sq. ft. each ; generally this accommodation should be similar to that outlined for Nurses' Homes in the section on " Hospitals."

Storage—Ample storage rooms must be provided for linen and this is often partly on each floor level and may be connected to a sewing room on the ground floor by a hand-lift. These storage rooms must provide for airing of linen as well as storage of both clean and dirty articles. A large store is also required for luggage. Storage for cleaning materials and supplies should be distributed throughout the building.

Means of Escape—Very great care should be taken in the planning of " houses " to insure easy means of circulation and especially adequate alternative means of escape in case of emergency. Staircases should follow the recommendations given for day schools and must be of fire-resisting construction, and corridor widths should be related to the amount of traffic at any point with a minimum width of 4 ft and better 5 ft for all normal purposes.

Provision for illness—It is necessary to provide at least two single rooms in all boarding houses which may be effectively isolated for use in sickness. For more serious illness it is necessary to provide a sanatorium when numbers exceed certain limits set out in the Regulations. Sanatoria have to provide wards for both infectious and non-infectious cases, and the total accommodation has to be for at least ten per cent of the total numbers of boarders. These buildings should follow the recommendations given in the section on "Hospitals," and should have wards, day-rooms and sanitary blocks, together with staff quarters for nursing and domestic staffs. The wards have to provide 120 sq. ft. and 1,200 cu. ft. per bed and beds must not be closer together than 6 ft.

6. *Technical Education*

Introduction—Modern technical education is becoming increasingly wider and will, under the 1944 Education Act, cover the more important trades, crafts, sciences and industrial processes. For the teaching of such varied subjects complex buildings differing greatly in both plan and equipment have to be provided; certain basic principles, however, can be found to govern the general planning of the more usual types, while the more specialised remainder only need to be provided in such districts where there is some special local requirement. Technical education formally commences with Secondary Schools for both boys and girls to which students may go immediately they leave the Primary (junior) Schools. Technical colleges or schools draw their students from all types of junior schools and Secondary Schools, and provide full-time day courses, part-time courses and evening classes. In most towns and cities it is customary to group the teaching of allied subjects in one school whenever possible, even to the point of having a whole but separate building devoted to a group of similar subjects; for example, a school of building separated from a school of art or engineering school placed in a different part of the town. When, however, departments are small in number the departmental grouping is usually combined in one building, especially when departments can use certain rooms in common. Large educational areas may need several schools, each devoted to the teaching of a particular type of subject. In addition, however, a school may be provided for other subjects in lesser demand, in which case the teaching is grouped together. Such a general building should be so placed that access from all parts of the area is reasonably simple. Schools are sometimes separated on the basis of sex, more especially for the junior schools; but in many subjects sex divisions are quite impossible and although some subjects are almost entirely for one sex, opportunity and provision of accommodation may have to be made for the occasional student of the other sex. It should also be remembered that schools used mainly for one sex in the daytime may be required for both sexes for the purpose of evening classes.

Sites—Sites for buildings for technical education usually have to be found in fairly heavily populated districts, as it is desirable to reduce the amount of travelling in which students, especially evening students, are involved. It is essential that there are good public transport facilities close to the site. The site area should provide ample space for car parking and more particularly the housing of bicycles. Facilities for outdoor recreation are essential to a limited extent for junior technical schools and are desirable for all schools, while playing fields are greatly appreciated when site conditions will permit of their provision. The site area should allow of the use of single-storey buildings for workshops if in any way possible, as multi-storied buildings for these uses are apt to cause undesirable vibration and noise which disturb study in adjoining rooms. The site area should allow for the possibility of some future extension, even if this involves additional floors over existing buildings. Back or side street access is desirable to the site to allow for deliveries of heavy machines, apparatus and materials by motor vehicles to workshops and laboratories and for the supply of fuel and other requirements to the boiler-house and the refectory. When the service entry to the site has to be planned from the main streets frontage, it should be so placed that it will cause the minimum inconvenience to the main entrance and the minimum disturbance to the quieter teaching rooms.

Aspect—Certain rooms for particular purposes require special aspects and these requirements need some consideration at the time of site selection, as well as during all the planning stages. Workshops and laboratories usually need north or east light, art rooms north light, classrooms south or south-east light, especially in schools used for daytime courses. Isolation from noise, particularly that from traffic in busy streets, is of the utmost importance for rooms such as lecture-theatres and classrooms.

Main Circulations—Figure 1 illustrates diagrammatically the important relationships of the main parts of a typical building with the essential circulations. Near the entrance, which may be divided for staff, visitors and students of each sex, must be placed any car park space available, cycle storage and cloakrooms. Cloakrooms for students should be near the students' entrances when these are secondary or separated for each sex. Adjoining the main entrance should be the rooms necessary for administration, including offices and the principal's room. It is advantageous to have the staff common rooms similarly situated in order to be centralised in the scheme. Lavatories must be attached to the administrative accommodation and the staff rooms. When an assembly hall is provided, especially if it is to be used for public meetings or performances, care must be taken to comply with local regulations

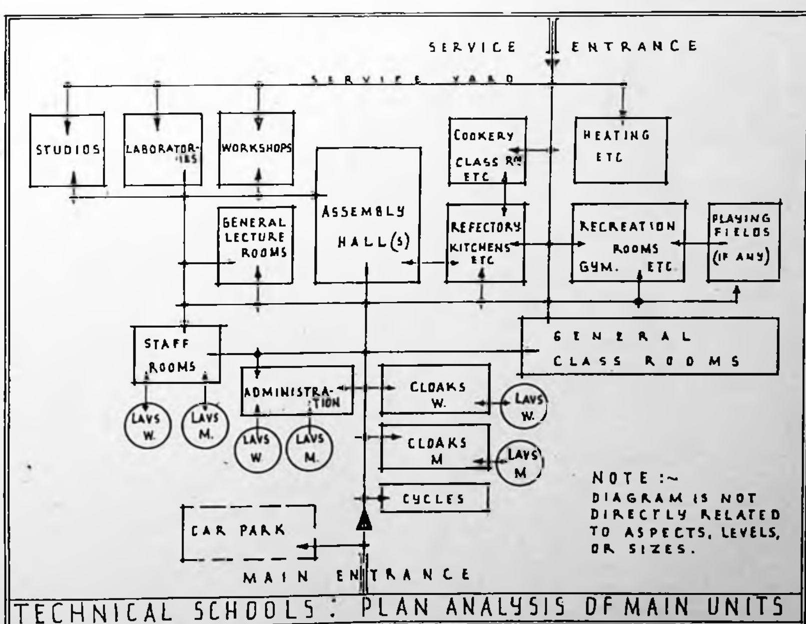


Figure 1

as to exits ; the assembly hall should be placed in a position easily accessible from outside the buildings so that visitors do not have to pass near teaching rooms but at the same time it must be readily accessible from all parts of the building used by the students. It is usual and desirable that the assembly hall be placed on the ground floor level.

The main teaching rooms may be divided into two types, namely, those for the sole use of one department, and those likely to be used at different times by several departments ; the former should be grouped together to concentrate each department and have attached to them the necessary rooms for administration of the department such as the office for head of department, departmental offices and stores. The departments may usually be placed on any floor level except those involving workshops with machines or which need heavy supplies ; these are usually placed on the ground floor and often in single-storey buildings. General rooms such as classrooms and lecture theatres used by several departments are usually grouped together in some central position and may be on upper floors. A refectory is often provided and it is advantageous to plan this near the assembly hall and the main entrance ; when there is a school of cookery the necessary rooms are often placed adjoining the refectory and its kitchens.

Communal rooms such as students' common rooms, library and gymnasium should be grouped together in a fairly central position. The students' common rooms and library often form a group near the entrance, but again may be on an upper floor.

A service entrance and yard is a very necessary provision ; it should give easy access to all workshops and stores where heavy materials and machines are used. A service lift may have to be installed for deliveries to upper floor rooms. The boiler-house and maintenance rooms and offices should be placed as centrally as possible in relation to the main demand for heat and power to reduce the lengths of main services.

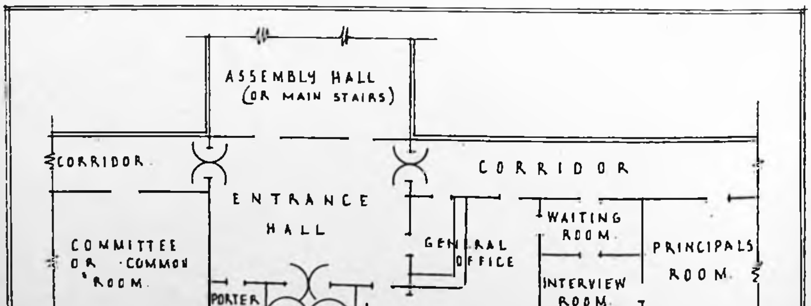
Entrances—Entrances, as previously stated, may be planned in various ways. Many schemes have one main entrance used by everybody visiting the building, and such a scheme has the advantage of reducing supervision and control to a minimum. Other schemes separate the normal student entrances, whether there are one or more, from the main entrance which is used only by visitors, staff and students desiring access to the offices. Some schemes use the main entrance hall also as an exhibition hall, but this does not seem to be a very desirable feature, and it would appear better either to provide a separate and properly designed room for this purpose, or to use a wide corridor, say connecting the entrance hall to the remainder of the building or the assembly hall.

Some schemes have separate entrances for each sex leading by way of the cloakrooms to the teaching-rooms, where both sexes meet again, unless the subjects taught are related mainly to students of one sex ; other schemes, especially when the building is very large and has many departments, use two or more entrances giving access to certain departments only, which have the advantage of reducing, in such large buildings, the amount of walking and possible congestion due to large numbers of students using the main circulations. At the main entrance there should be a porter's and general inquiry office controlling all persons entering and leaving the building.

Administration — Adjoining the entrance hall must be placed the administrative offices, which vary in size in proportion to the numbers of the students. The general office is usually arranged with a long counter where all inquiries, excepting those which are purely departmental, are dealt with. Fees are paid at this office, and generally materials, stationery and books are also sold to the students. In addition to the general office, there is usually an office for the secretary, often with a waiting room, accountant's office, clerical staff offices and the principal's room ; the last should have a waiting room attached. Many schemes need, in addition, a board or management committee room. Storage rooms for records, stationery, materials, books and other supplies should be grouped with the offices and be readily accessible from them. All planning of this office suite must provide for all inquiries to be dealt with at the general office in the first instance, and access to the principal and secretary must only be available after an interview at the main counter of the general office. Separate cloakroom and lavatory accommodation for both sexes is needed for the administrative staff and also attached to the committee or board room. The principal usually has lavatory accommodation adjoining his office. Since the general office frequently has to deal with large crowds within short periods, especially when it acts also as the book and material shop, very long counters are of the greatest importance, and it is desirable to have two doorways to the public space to avoid congestion and to keep students moving in one direction. These rooms call for little special planning as they are normal offices. The committee room which is used for meetings of various bodies, such as governors, board of studies and examiners, should be planned on the lines of a board room as discussed in the sections on "Municipal Buildings" and "Offices."

It is desirable that the assembly hall may be approached from the main entrance hall even if the hall has separate entrances directly from the street as may be needed if it is planned to be let separately for public meetings or performances. If separate entrances are not provided a position immediately in front of visitors entering the building is desirable for the assembly hall, so that visitors have no need to enter the corridors giving access to teaching rooms and intermingle with students and cause unnecessary congestion. A central position near the entrance often assists in isolating the hall from teaching rooms, which might be disturbed by users of the hall, and equally the workshops might interfere with the use of the hall.

Figure 2 illustrates the main entrance of a scheme where one entrance only is provided to serve for all purposes including the assembly hall, but excepting the service approach. If the assembly hall is not planned in the position indicated it is desirable that the space is occupied by the main vertical circulation staircase and main corridor leading to teaching rooms and workshops, or it might be used for the exhibition hall. At the side of the actual entrance are placed the porter's office and telephone exchange, the latter forming part of the general office, although in some schools the porter also controls the telephone. The general office, with its counter space, adjoins the entrance hall and



TECHNICAL SCHOOLS : THE ENTRANCE & ADMINISTRATION

Figure 2

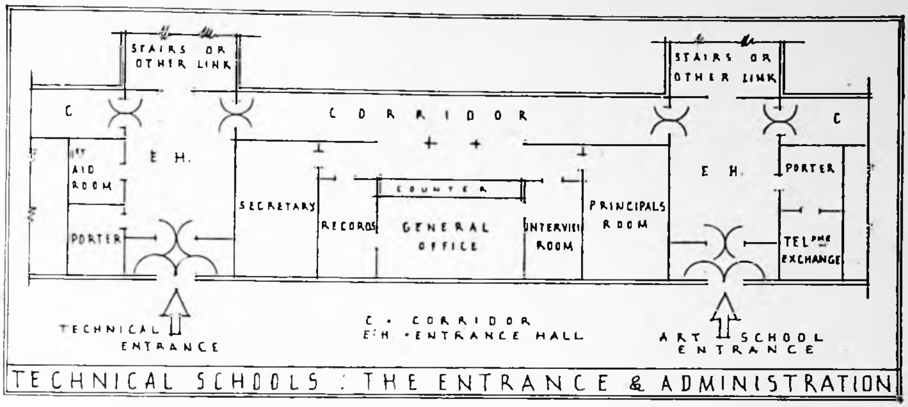


Figure 3

gives access to the waiting room, interview room, and principal's office. The committee room is placed on the opposite side of the entrance hall from the administrative offices.

Figure 3 illustrates a larger scheme where two entrances are provided, each serving separate groups of departments. One group of administrative offices is common to both sets of departments and is consequently planned between the two entrances in order to be available equally to students of either groups. The general office in this scheme has a counter set back from the main circulation corridor. Opposite the general office could be placed such rooms as might be needed jointly by students of all departments, such as the assembly hall, gymnasium, refectory or exhibition hall, or the space may be used for the remainder of the administrative offices necessary for a large institution. The offices for the secretary and principal are grouped with the general office to ensure control of all callers. A scheme such as this, with two entrances, requires a porter to control each approach. A first aid room is provided at the entrance to the technical departments, in which minor injuries may be attended to and in which the essential medical necessities may be stored for emergencies. The school shop may, as already stated, form part of the general office, but in some schemes it is planned as a separate unit ; considerable space is needed for this purpose in connection with certain subjects, or in schools where many and varied subjects are taught. The detail planning is entirely dependent on the subjects taught at each school, and the materials, instruments and books necessary in each case. Considerable storage space, preferably adjoining, or at least in very close proximity to the shop counter, is most important. Space for the display of some of the articles stocked and for books is desirable.

Corridors—A satisfactory width for general corridors giving access to teaching rooms is 7 ft ; this width may be reduced a little for short lengths of corridor to, say, 6 ft and it should be increased for important main corridors carrying much traffic. Lockers are often placed in corridors, as will be discussed in the paragraphs on cloakrooms and when such an arrangement is adopted corridors should be increased in width by about 2 ft if lockers are placed on one side, and 4 ft when placed on both sides, to provide a normal walking width, to allow for the lockers themselves and space for the locker doors when open. It is better, however, to avoid placing lockers in corridors also movable furniture such as seats, showcases or storage cupboards. If it is considered necessary to place cupboards or showcases in corridors it is wise to build what is equivalent to double walls between the corridor and the classrooms, and place built-in fittings in the thickness thus formed, which provides flush faces to both corridors and classrooms, while the doors to the fittings may open on whichever side is needed. *Cul-de-sac* corridors should be avoided and, when possible, long corridors, especially those with rooms on both sides should be broken up with swing doors at intervals to reduce draught and noise. Long corridors should also have bays formed to provide natural light and ventilation. Good light and adequate ventilation are desirable for all corridors and consequently it is desirable to avoid continuous building on both sides.

When glazed showcases are introduced into corridor sides the lower edge of the glass should be kept well clear of the floor to avoid risk of kicking ; doors to display cases of this type must lock, and a depth greater than 18 or 21 in is seldom needed. Display cases are of little value when more than about 6 ft above the floor, as the top shelf should not be above a normal eye-line and in junior technical schools the lower average height of students compared to that of adult or older students of senior schools should be borne in mind.

The finish of corridors should be carefully considered in relation to upkeep, more especially cleaning. Floors which have to be washed continually should be used only near entrances and elsewhere they are better if finished with wood block, linoleum, rubber and similar materials which may be machine polished. Materials should be chosen to reduce noise to a minimum ; they should be laid on a solid base and not on hollow surfaces such as boarding or joists.

Staircases—At least two staircases are essential in all multi-storied buildings and at least one wall should be external so that daylight may be provided. Staircases must be of fire-resisting construction and should have a minimum width of 4 ft, but widths over 6 ft are generally unnecessary. Treads should be from 11 to 13 in wide and risers $5\frac{1}{2}$ to 6 in high ; all winders should be avoided. Continuous handrails are desirable placed on both sides of staircases. Short flights of only a few steps should be avoided, as they are apt to be dangerous. Room or corridor doors should be planned away from top steps of flights and from positions near landings. Doors to teaching rooms should, if possible, be placed not more than 120 ft from a staircase. External escape staircases should be avoided whenever possible.

Cloakrooms—In large institutions cloakrooms present a very difficult problem, especially in those having large numbers of evening students in addition to day students. The perfect solution does not seem to have been found ; each scheme must be treated on its own merits in relation to numbers of students of each type and to some extent depends on the subjects taught. The storage of books, materials, tools and instruments has to be considered in addition to clothing. Individual lockers are desirable, and almost essential, for day students, and are needed for at least a proportion of evening students. Lockers are costly and occupy considerable space ; lockers for 500 students need at least 1,500 sq. ft., and if changing space is also required a great increase in floor area is essential. Dimensions and spacing of lockers in rooms given is in the section on "Factory Buildings." As already mentioned, lockers should be avoided in corridors. Book lockers, as apart from cloak lockers are detailed in the section

on "Schools." Lockers are usually 12 in square and 6 ft high, and, therefore, it is necessary to allow 3 to 4 sq. ft. of floor space per person, but if the locker room is to be used also as a changing room an area of 6 or 7 sq. ft. is needed to allow space for seats. Lockers should be heated and ventilation to locker rooms should be considered carefully.

In institutions where the number of students is very large, particularly in regard to evening students, it is usually impossible to provide individual lockers for all students and, although a number should be available, some form of cloak accommodation must be provided ; the latter provision may be made in various ways, such as in central cloakrooms either controlled or open, in small cloakrooms attached to each department, or by means of cupboards or large lockers in teaching rooms or workshops. Central cloakrooms have several faults which are difficult to overcome ; if not properly and continuously supervised losses are apt to be considerable and if controlled by attendants the service is liable to be too slow to handle the clothing of large numbers of students in very short periods before and after teaching sessions. In either controlled or uncontrolled general cloakrooms numbered hat and coat pegs should be provided and required to be spaced as detailed in the sections on "Factory Buildings" and "Schools." Pegs should be spaced 12 in apart in single tiers and it is usually unnecessary to provide seats or shoe lockers, except if they are to be used by day students. As in locker rooms, general cloakrooms should be heated and very well ventilated. For evening students, in order that they may supervise their own clothing and deposit or obtain it quickly, it is often considered better to provide accommodation in the actual teaching rooms, and for this purpose rows of clothes pegs are placed in the rooms themselves ; this scheme has an untidy appearance and if the clothes are wet is apt to be unpleasant. To overcome the difficulty of hanging the clothes in the room itself cupboards may be provided in which the clothes are placed, but it is desirable that these cupboards are heated and ventilated. Consequently the scheme indicated in Figure 4 has been used ; this arrangement places the clothes in a series of cupboards formed in the thickness of double corridor partitions, which may be heated and ventilated. Ventilation is arranged by drawing the air from the classrooms through the cupboards into ducts placed over the corridor, where less height than the classrooms is needed. Borrowed light for the corridor may still be arranged as indicated on Figure 4. If the cupboards are constructed in units of 4 ft 6 in or 5 ft, with pairs of doors along the full length of the corridor wall (except where the room door is placed), those not required for clothes storage may be used for general storage of materials needed for teaching purposes. The placing of individual lockers in teaching rooms is only possible when the rooms are used almost entirely by the same set of students, otherwise interruptions are liable to be disturbing due to students needing access to their lockers. In large institutions it seems more satisfactory to place groups of locker rooms near each department for the use of students of the department only ; by this arrangement each room is smaller and may often be planned in a position of little value for teaching purposes.

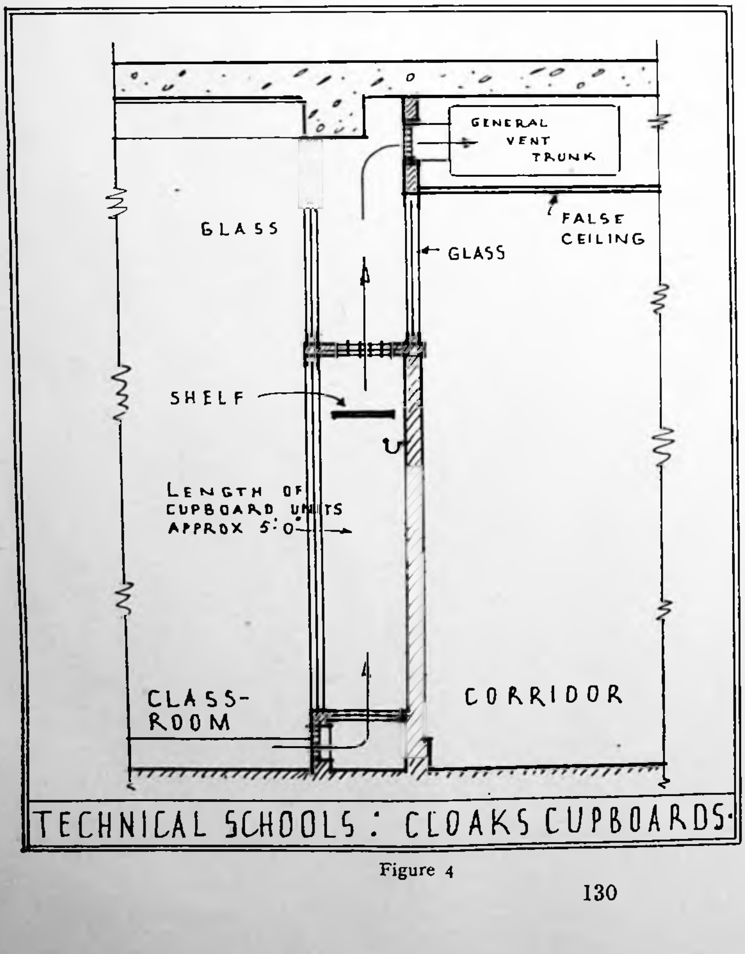


Figure 4

Lavatories—It is desirable in large buildings to distribute the sanitary accommodation in various parts of the building rather than to assemble it all in one position. The main group should be near the cloakrooms, especially when there are general cloakrooms serving the whole building. Small groups may be attached to each department, that is, situated away from any main lavatory accommodation. Workshops in particular should have some lavatory accommodation attached to them. It should, however, be borne in mind that costs are likely to be increased when sanitary accommodation is spread about the building. It is usual to place lavatory basins in a room separate from W.C.s and urinals, although the compartments should generally adjoin one another to simplify plumbing and services as much as possible. Separate lavatory basin facilities for workshops are essential, even if W.C.s or urinals are not possible. Hot-water supplies are essential for all wash basins. Basins should be provided at the rate of one for every 8 of the first 100 students with an addition of one for every 10 between 100 and 200 and one for every 12 over 200 ; these numbers are for general use ; if there are workshops the basins provided in that section of the building should be additional.

W.C.s should be provided at the rate of one for every 25 up to 200 male students and one for every additional 30 students ; urinals are needed at the rate of one for each 10 up to 100, thereafter one for every 12. Female students require one W.C. for every 10 up to 100 and one additional one for each 25 students. Numbers should be based on the maximum number of students likely to be in attendance at any one period. The assembly hall should have separate lavatory and W.C. provisions for both sexes for the public and also attached to any dressing rooms which may be provided. Lavatory and W.C. accommodation for each sex should be attached to both teaching and clerical staff rooms and offices.

Drinking fountains should be provided in all lavatory rooms, the vertical jet-type being the best. All sanitary accommodation must be so placed that daylight and ample ventilation is available ; it may be found

desirable to assist the latter by mechanical means. Detailed planning information regarding spacing and arrangement of basins, W.C.s and urinals is given in the section on "Lavatories, Public and Communal."

Staff Rooms—A staff common room is essential in all schools and where there are teachers of both sexes a separate room should be provided for the women teachers. The rooms should provide about 30 sq. ft. of floor space per head of the maximum number of staff likely to be in the building at any time. Staff cloakrooms and lavatories should be adjacent to the common rooms, although it is not usual to plan them leading directly out of the common rooms. In some institutions a number of small study rooms are provided for the use of staff wishing to work quietly; these rooms need a floor area of 80 or 100 sq. ft. with good daylight. Rooms may also be needed for heads of departments which may either be grouped together near the staff common rooms or, alternatively, may be placed with their own departmental teaching accommodation. Rooms for departmental heads need an area of about 180 sq. ft. Many larger departments carry out a part of their own administration and require space for a secretary or clerk to the head of the department and a room for this use may have to be provided for this purpose; such rooms should have an area of at least 100 sq. ft. to allow for working space and some filing space and should be planned adjoining the room for the departmental head, preferably in such a manner that they may control access to the head's room as there are likely to be many visitors such as prospective students and their parents; these rooms or their approach lobbies are convenient for use as waiting rooms for those wishing to see the departmental head. A small lavatory with a W.C. is an asset attached to rooms for heads of departments; if this cannot be provided a basin is often installed in a recess which may be used for hanging cloaks. Figure 5 illustrates a typical staff room suite providing a general staff room used mainly by the male teachers with a small room adjoining for the use of the women teachers. A cloakroom and lavatory is provided opening directly out of the women's room and another lavatory and cloakroom is provided adjoining the women's lavatory for the male staff, thus the main plumbing is well grouped together. On the opposite side of the corridor are placed two rooms for the head of a department and his clerk, with a private lavatory attached to the former. The remainder of the suite is two small study rooms for the use of ordinary members of the staff. Lockers should be provided for clothing of each member of the staff; this is better placed in the lavatory which thus serves also as a cloakroom, as is the case in the example on Figure 5.

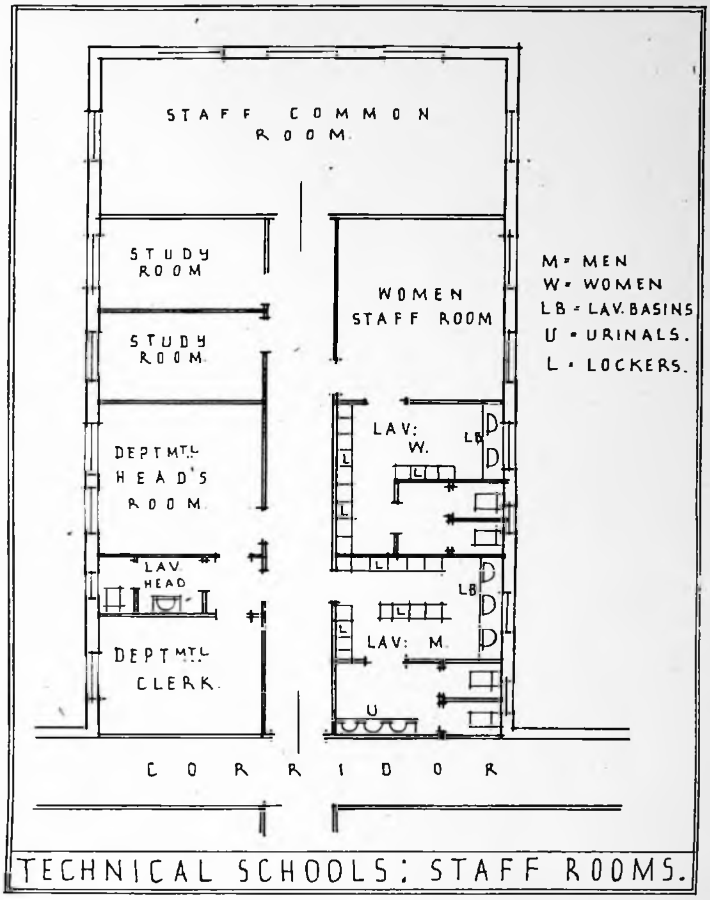


Figure 5

Lockers for the storage of the books and papers of each member other than departmental heads, or those with private rooms, should also be provided and these are often placed in the common rooms themselves but should be arranged to cause minimum discomfort to members in what is in fact a rest room.

Rooms for Non-teaching Staff—Attached to all larger technical institutions is a considerable number of staff apart from actual teachers; this staff includes porters, laboratory assistants, cleaners and engineers, whose attendance hours are often spread over long periods with intermittent breaks and consequently a room must be provided for them which is often in the nature of a canteen where food is either obtainable or simple facilities are provided for heating up food, making tea, etc. The room should provide a floor area of about 12 to 15 sq. ft. per head of the maximum number of staff likely to be in the building at any one time. The cloakroom and lavatories needed for the staff of this type, which may be of both sexes, may be placed with advantage adjoining the canteen. If food service is to be provided it is essential that the canteen be planned within easy access of the kitchen used in conjunction with the refectory. These rooms are often placed in basements, but reasonably good daylight should be available.

Students' Common Rooms—The importance of providing suitable rooms for use as students' common rooms has frequently been overlooked in the past but should be regarded as essential. It is, of course, impossible and even unnecessary to provide rooms large enough to seat all the students of the institution, but the greater the area the more they are likely to be used. These rooms may with advantage be grouped with the refectory and the library so that all the common rooms to be used by students of all departments form one group. The accommodation desirable is a large room for general use, a smaller room for reading and writing, a room for women students which should act as a retiring room, and one or more small rooms suitable for club meetings or for the use of an individual club or society. If circumstances permit, a games room is very useful. It is desirable that these rooms have good daylight and, whenever possible, a southerly aspect.

Assembly Halls—These may be used for various purposes, and it is probable that from time to time public lectures and performances may be given. As already pointed out, the hall should be in such a position that the public and all visitors to the functions particularly connected with the school do not disturb the normal working of the remainder of the building. It is, therefore, desirable

that the hall should be near the main entrance and, if it is to be used frequently by the public separate external approaches are an advantage. When the public are to have access to the hall it is necessary to plan entrances, exits, staircases, seating, etc., to conform with local regulations controlling buildings for public entertainment ; this is specially important if a cinematograph is to be installed, which is becoming a general provision in buildings of this type. The projection box must have proper cut-offs and alternative means of escape for the operators. (See section " Community Centres.")

In small institutions where a large room to be used solely as an assembly hall is uneconomic, a suitable space should be provided by using two or more adjoining classrooms divided by folding partitions. Assembly halls are sometimes used also as dining halls, although such a dual purpose has definite disadvantages, since each normal use is likely to be interrupted frequently.

The sizes of assembly halls for normal uses should be calculated to provide at least 6 sq. ft. of floor space per person, including the necessary gangways, or for examinations of 20 sq. ft. per person.

In some institutions the assembly hall serves also as the gymnasium, but such an arrangement is very undesirable, and detrimental to the proper uses of either a hall or a gymnasium.

The hall should be so placed that all teaching rooms are isolated from it as much as possible ; good daylight is desirable, especially if the hall serves for examination purposes.

The planning of a hall on the street frontage makes possible direct public access without entering the school, but a more central position in the plan is usually more advantageous for other reasons ; also it seems much better to place the hall centrally in the group of buildings rather than at one end, so that it is equally accessible to all parts of the school. The hall should not be used as a passageway for access to any other parts of the building. Approaches, and if possible exits, should be under cover. Ceilings are best if flat and not more than 30 ft above floors. The notes regarding sections in assembly halls for other types of schools given in the section on " Schools," apply equally to technical schools. Acoustics must be considered carefully when deciding the plan and section shapes. To provide additional seating balconies are often introduced, and easy approach from the hall entrance up to the balcony is very important. The figure given in the section on " Schools " concerning the linking up of a number of the larger units of the plan such as the dining hall, and gymnasium, is worthy of consideration for technical schools. Floors in halls of this type should be flat without falls towards the stage, because of the uses of the hall other than in conjunction with the stage, such as school socials, examinations and special exhibitions. Wood block floors are usual with a wood dado on the lower part of the walls, while hard plaster on walls should be avoided to assist acoustics.

Figure 6 illustrates certain points of planning (more especially in connection with circulations) in relation to assembly halls. Diagram A shows a plan and section of an assembly hall two storeys in height, where daylight from side windows is considered necessary ; consequently, the corridors are planned on the long sides of the hall on the lower or main hall floor level only, and circulations on the upper level are available only at the ends of the hall and at one end include access to the balcony within the hall itself. Further storeys over the hall may be added to this type of plan if sufficient light is available from the side windows without the addition of top light. In passing it should be noted that if these halls are to be used in daylight for certain purposes such as stage performances, darkness is needed ; side-lights are easier to fit with blinds than top-lights ; however, the main uses of this type are likely to be after dark as a general rule, excepting cinematograph and lantern lectures for day students.

Diagram B shows a further plan and section in which side light is available on one side of the hall only, the other side being needed for approach corridors at each floor level. If the upper storey is not required corridors may be placed on both sides and the hall lighted entirely from the roof. It is usually difficult to provide adequate light for such purposes as examinations from one side only of wide halls even with windows placed at a very high level. A plan of this type does, however, permit of direct exit to the open air, and not into corridors to other parts of the building.

Platform—The platform area must provide space for small orchestral or theatrical performances ; the latter necessitates space for rear exits behind the actual stage, and 20 ft should be considered as a minimum depth behind the proscenium. A fixed proscenium is not necessary, but may be considered desirable in some schemes. Stage heights depend on the size of the hall, but 3 ft 6 in is a fairly usual height above the main floor level. A simple but efficient stage lighting system is essential, with ceiling battens and flood or spot lights, and footlights on hinged flaps to close away into the floor when not in use. Chair storage may be provided conveniently under the stage, but a height of 6 ft 6 in. in the clear should be arranged. Access is obtainable through the riser of the stage front, but it is better to have 6 ft or 8 ft of the main floor removable to give access to the under stage level, this sinking may also be useful as an orchestra pit in conjunction with stage performances.

Figure 7 illustrates this suggestion, and shows how the orchestra pit may be formed for the full width of the stage except for any necessary width required for access to the stage. The portion of the main floor normally covering this area is made in sections for quick removal, part of the stage front is also made removable, and a temporary barrier or orchestra front is needed, together with a temporary extra portion to close the opening between the bottom of the normal stage front and the floor of the pit. Steps are better if kept at the ends of the pit, where they may be permanent and serve for access to the orchestra pit as well as for handling chairs, etc., for the store.

At least one dressing room for each sex should be provided, with cloakroom and lavatory accommodation adjoining or even approached directly out of the dressing rooms. These rooms must be very close to the stage, and should have an area of at least 200 sq. ft., and preferably rather more. It is desirable that these rooms are at the same level as the stage.

If the hall is to be used by the public, cloakrooms and lavatories for

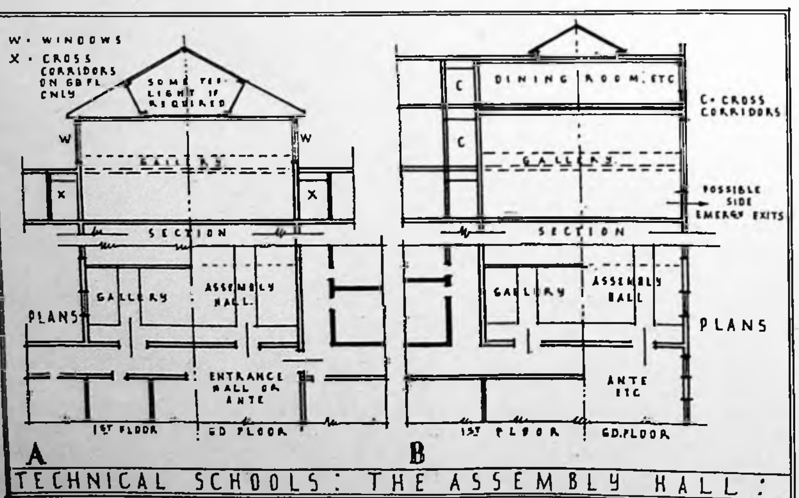


Figure 6

each sex should be provided near the entrance to the hall. In many schemes it may be found possible to plan the general cloakrooms of the school in such a position that they may serve also the hall. Information regarding the layout of seating and the requirements of corridors, staircases and exit doorways is given in various sections, and applies in general to halls of this type, which need to be planned to conform to the usual requirements of places of public entertainment.

Refectory—In the majority of buildings of this type facilities for the service of meals have to be provided, as the students are likely to be drawn from a large area and

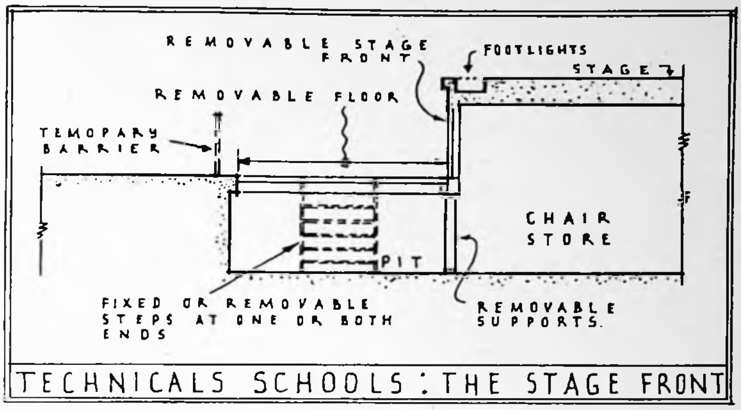


Figure 7

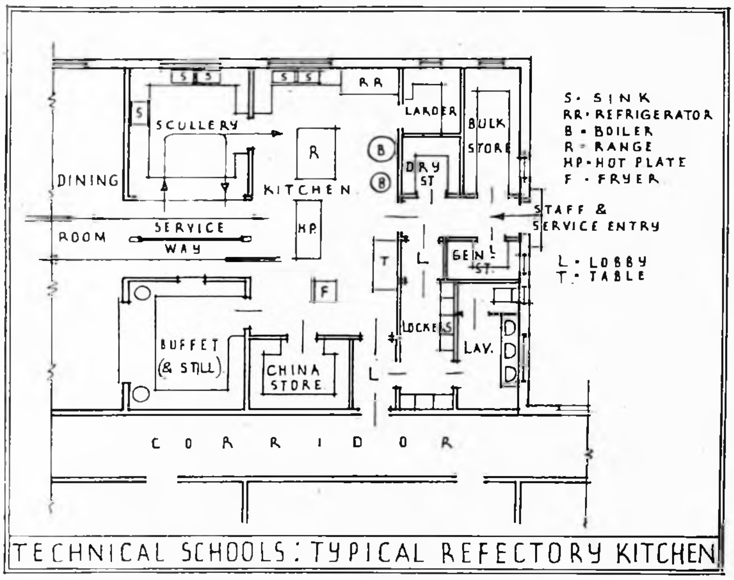


Figure 8

consequently are unable to reach home for their meals. Schools providing evening classes in addition to day tuition often find that many students like to come directly from their employment to the school without going home and, therefore, like to be able to obtain some refreshment before the evening session commences. The meals to be served are usually of a simple nature which do not require very elaborate kitchen equipment and much of the service, except luncheon for the day students, is of the light refreshment type. Some institutions cater on the self-service lines and others with waitress service; a combination of both types may be an advantage in schemes dealing with both day and evening classes. The floor area to be provided should be calculated on the basis of 8 to 10 sq. ft. per person on the maximum number likely to be served at any time; these areas are based on the use of fairly large tables seating at least eight or ten persons, as small tables for four require rather greater space for comfortable service circulation.

The refectory should be placed in a position easily accessible to all parts of the building, as it is likely to be required by staff and students of all departments. There is no objection to planning the room on an upper floor with other communal rooms, such as common rooms. If an upper floor position is chosen, the kitchen should be on the same level and, therefore, a service lift must be installed for handling tradesmen's deliveries. An upper floor has the advantage that the kitchens may be ventilated easily without cooking smells penetrating to the remainder of the building. If, as already stated, there is a school of cookery included in the curriculum, it should be planned adjoining the dining hall and kitchens and, if possible, on the same level or immediately above or below. Students in the cookery school may then be trained in part by the practical preparation of meals for the dining hall and the same services may also be used.

Wood floors are the most pleasant for dining halls, although linoleum may be preferred in some schemes. Kitchens, sculleries, etc., are better with solid floors or tile or terrazzo, but again linoleum on cement screed may be preferred. Walls of kitchens should have a high tile dado. Dining halls frequently have a wood panelled dado. The rooms should be well lighted both by night and day while good and cross ventilation is essential.

The kitchen rooms should provide for the actual cooking, a scullery or scullery recess, larder, store rooms, cloakroom and lavatory for kitchen staff and in large institutions a small office for the manager and a kitchen staff mess and rest room. The food from the kitchen should be handled through a servery. The area needed for the kitchen and ancillary rooms will vary from a quarter to one half of the dining hall floor area, and a figure near the latter should be generally assumed. Proper sequence of circulation through the kitchens and layout of equipment is very important. Figure 8 illustrates a typical layout for the kitchens for a school refectory. The service rooms are here placed on the long axis of the room, but whenever possible are better placed on the short axis of the refectory for ease and quickness of service. The circulation enters past the wash-up, where dirty crockery or glass is deposited, and certain clean articles collected from racks. The waitress then proceeds to the hot-plate and returns past the buffet and still room. The equipment of the kitchen is likely to be arranged partly round the walls, but some equipment—for example, the range—may be free-standing. The various stores for goods, china, glass and food (larder) are arranged round the kitchen, while those dealing with bulk supplies should be planned near the service entrance or goods lift. The figure shows a useful supervision approach from the corridor passing the staff cloakroom and lavatory. Cafeteria service may be preferred; this is dealt with under several other sections of this book.

Exhibition Halls—These should provide facilities for semi-permanent loan exhibitions or exhibitions of current school work or subjects of immediate technical or topical interest. The exhibitions vary considerably according to the subjects taught, and in an institute with many departments they are likely to be of very different

sizes and character. An alternative to a central exhibition hall is to provide for small exhibits attached to each department, but there seem many advantages in the idea of a central exhibition hall, particularly in regard to contacts with the general public.

The essential factors in planning an exhibition hall of this type should be accessibility for public and students, and really good light; the former demands a position near the main entrance in order to control visitors and to keep them out of the circulations from which teaching rooms are approached. The windows should be placed at a high level, to leave clear the wall space below for exhibits either in cases or fixed to the walls. Top light should be provided when the remainder of the accommodation will permit. Any bays required should be formed with movable screens or cases, so that everything may be rearranged quickly and easily. Various information appertaining to rooms of this type may be found in the section on "Museums." Sizes cannot usefully be given, being dependent on the subjects taught, as some are more suitable as exhibition material than others. Some departments may require a museum or exhibition space used only for the work of that department. Such, for example, is a materials exhibition for a building department; such a museum should then form part of the departmental accommodation, and must be of a size suitable to the particular department. It is an advantage to prepare the walls of rooms to be so used for fixing or hanging exhibits. Heavy battens fixed horizontally to the walls at 12 or 15 in intervals, either showing or behind a covering such as a fabric, are extremely useful. Glass cases of both wall and island types are often needed and should be designed in units which may be moved without too much difficulty except for essentially permanent exhibits. For general purposes cases do not need to be more than 6 ft 6 in or 7 ft in height.

Libraries—The provision of a library is now considered an essential in all educational buildings. The library may be provided in one of two ways, or even a combination of both. A large central library has many advantages, but departmental libraries attached to other departmental accommodation may be preferred; but they seem more difficult to control, although the particular books students may need are more readily available to the students, especially if the latter are carrying out research work. The combined scheme caters for both types, and may be found very useful if the main library is used for general reading and reference and the departmental libraries are used as study rooms, with a limited selection of general works on a specific subject available. The provision of a general reading room with comfortable chairs and tables for study is an advantage, as students are less disturbed than if they are seated in the library itself. Planning information for libraries of this type has already been given fully in the sections on "Libraries" and "Schools." The general figures on which shelf space should be based is eight books per foot run and six rows or shelves in the normal height of a bookcase. A greater height than 6 ft 6 in or 7 ft for bookcases is of little value, as the books are out of reach without steps or ladders.

Storage—The amount and positions of storage accommodation depend on the subjects to be taught, size of the institution, system of buying and acceptance of deliveries of materials and other supplies. Each department needs suitable storage space grouped with its other accommodation for storage of materials, apparatus, and often, it should be noted, of students' work in progress; the last need may require a very large amount of space in some departments.

General storage is needed for the administrative offices, school shop and bulk materials for cleaning and upkeep of the building, furniture, fittings, etc. Adequate and proper accommodation is essential for the cleaning staff of the building where equipment and supplies may be stored and water supplies are available; cleaners' rooms should be distributed on various levels throughout the building.

Some large schemes may justify considerable accommodation for a maintenance staff, but in all schemes at least some storage space should be provided near the boiler room for the engineer in charge of the heating and electrical services for carrying on minor maintenance work and in which to keep supplies such as electric lamps.

Caretaker — In most schemes accommodation has to be provided for a resident caretaker. As many buildings of these types are in urban areas the necessary accommodation must take the form of a flat, which may be placed in a semi-basement or on an upper floor, the latter being the most desirable. In less urban schemes a cottage is often provided. The general accommodation needed is a sitting-room, kitchen, two or three bedrooms, bathroom, W.C. and a fuel storage. If a flat is provided refuse (dustbins) should be considered carefully, and also some provision (for example, a balcony) for the drying of clothes; access to the flat should be provided from a secondary staircase and a secondary means of escape should be available if it is on the second or higher floor levels.

Cycle Storage—Storage for cycles is needed in most technical institutions, but the amount necessarily varies considerably according to the size of the area from which students are drawn, the available public transport facilities and the habits of the district. In addition to pedal-cycles, provision has to be made for motor-cycles and for motor-cars; motor-cycles should be provided with covered space, but open-air parking space is sufficient for motor-cars. Motor-cycles require more space than pedal-cycles, as they cannot be placed in similar racks at varying levels, or semi-vertically, as is possible for cycles. Details and sizes needed for cycle storage have been given in various other sections, but in the selection of the type of rack it should be borne in mind that younger students may be unable to use the types which involve lifting the machine; if racks of the semi-vertical types are used provision for separate storage of oil lamps must be made. It is usually found inconvenient to have cycle stores entirely closed and it is generally considered that students have to take their own precautions against theft.

Cycle storage may be planned in two general positions, first, in open-sided sheds in courtyards or other open spaces and, secondly, in basements or semi-basements approached by ramps from street levels. If the first system is used care should be taken that the sheds are properly designed in conjunction with surrounding walls and fences or as independent buildings and not so as to give the appearance of having been casually erected without proper consideration or care for appearance, with untidiness as a result. When positions in basements are selected the ramps must not have steep gradients, and great care should be taken in regard to the non-slip surface finish selected for the ramps. (See also sections: "Schools" and "Factories.")

Teaching Rooms—There are certain rooms used for teaching purposes which are likely to be similar in design for the use of almost all departments and subjects; such rooms include general lecture theatres, general classrooms and drawing offices. Many of the subjects taught only require an ordinary classroom with no special permanent equipment, and only the usual blackboard and lecturer's desk. It is proposed, therefore, to discuss first, the requirements of such rooms as are capable of general application before considering special rooms for the teaching of particular subjects.

Classrooms — Classrooms needed in technical schools are similar in most general respects to those described for secondary schools in the section on "Schools" excepting that technical schools have generally to provide for adult students; in consequence more floor space and desk area is needed per head. Desks should provide at least 2 ft run of desk per person, and preferably a little more, and it will then be found that a floor area of 20 sq. ft. per person will be needed. As in secondary schools, windows should be equal to at least one-fifth of the floor area and light should come mainly from the left-hand side of students.

It is better that rooms should not exceed 20 ft in width, in order to provide adequate light on the desks farthest from the windows in rooms of normal heights; it is also desirable that classrooms shall not be more than 30 ft long. Lecturers should have a raised platform about 9 in above the general floor level with a bench fitted with drawers and cupboards 6 ft 6 in long, 2 ft 6 in high, and 1 ft 9 in or even 2 ft wide. It is better that the entrance doors to rooms from the approach corridors are placed at the same end of the room as the lecturer's platform.

Figure 9 illustrates diagrammatically the layout of a classroom. Single or dual tables are the most usual equipment for classrooms, although some authorities prefer desks; whether desks or tables are used, these should be on the basis of 2 ft run per person, so that dual tables should be 4 ft long with access gangways of 1 ft 6 in between tables. Single tables require similar gangways on one side at least. Figure 9 shows the essential dimensions of adult seating for general classrooms and also the incorporation of the wardrobe or book cupboards against the corridor wall as discussed previously, and detailed in Figure 6. The position of the entrance door to the room should be noted, as it is set on the corridor face, and not on the inner face of the cupboards to economise floor space. At least 8 ft should be allowed between the front row of desks or tables and the wall for the lecturer's platform and desk. Gangways round the outside of seating and at the back should be at least 1 ft 6 in clear of any projections or radiators. If cupboards are provided against the corridor wall the gangway must be increased to 3 ft in width even if sliding doors are used for the cupboards; sliding doors save space, but are usually more noisy and costly than those hung on butts, and in addition if they run easily there is a risk of fingers being pinched if they are hurriedly opened or closed.

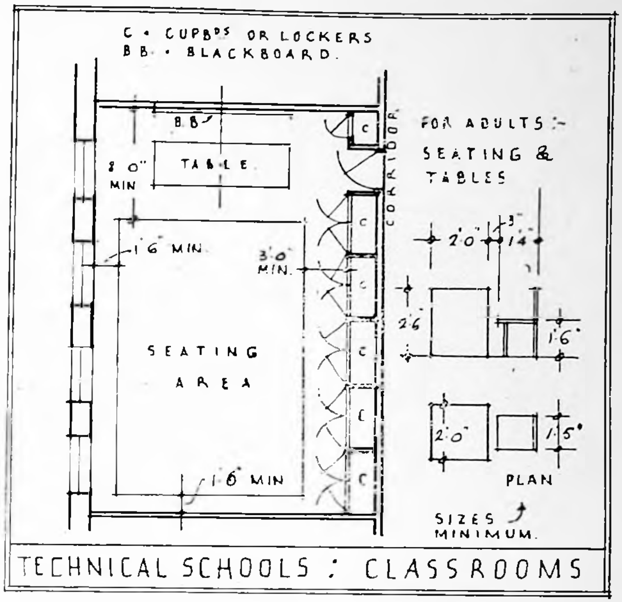


Figure 9

Gymnasium—A gymnasium is now required in almost every educational building; it should be so placed that it is equally accessible from all sections of the building. It is an advantage if the gymnasium can be planned as a detached building in order to isolate noise likely to disturb any nearby teaching rooms; covered connecting ways are desirable although not essential, if it is a separate unit, since they form a protection to students passing to and fro with no outdoor clothing. A clear floor area of at least 2,800 sq. ft. should be provided, and the room should be not less than 40 ft wide. A height of at least 18 ft is necessary, and if possible there should be a flat ceiling to which apparatus may be attached. It is an advantage if one long wall can be opened for a considerable part of its length and face southwards, with suitable doors leading to a space for open-air exercises. If one wall is almost entirely occupied by windows it may limit the wall area available for apparatus such as wall bars, but access to a suitable open space may be considered a greater advantage. Information on the planning of gymnasia has been given for secondary schools and, excepting rather larger floor area desirable for adults, the same information applies for technical schools. Windows should be placed on both sides of the room and extend from the ceiling to about 7 ft 6 in above the floor; windows with sills lower than this level are partly hidden by apparatus, thus becoming inaccessible, while the student, being silhouetted against the light, cannot be watched satisfactorily by the instructor. Changing room accommodation should be provided for on the basis of the anticipated maximum number able to use the room at any time and if two sexes are likely to use the room at different but immediately successive times, it will probably be found desirable to duplicate changing rooms and lavatories; changing rooms need an area of 7 to 10 sq. ft. per person. Shower baths and lavatory basins should be provided at the rate of about one to every six or seven persons. W.C.s and urinals are desirable and provision for two of each is usually adequate. Two other rooms are necessary, one for the instructor, and one, opening directly out of the gymnasium, for apparatus storage; both these rooms need an area of about 100 sq. ft., and the latter should have a pair of doors so that large equipment may be moved easily. The finish of a gymnasium floor usually consists of secret nailed boards laid across the room on joists. Radiators should be in recesses, and good artificial light near the ceiling with even distribution over the whole area.

Sometimes a gallery for spectators is needed and this may often be planned with advantage over the changing rooms, instructor's room and apparatus store, which do not need the same height as the gymnasium itself. Two staircases to the gallery are desirable, suitably placed to give quick and easy access and exit without visitors having to enter the gymnasium itself. If a gallery is provided fixed wooden seating is needed in tiers rising rapidly towards the back, as this arrangement gives as clear a view of the floor as it is possible to arrange. (See also section: "Schools.")

Lecture Rooms—Lecture rooms, apart from normal classrooms, are required in many technical institutions some of which may be used solely by one department and others shared by several departments. The general requirements as regards seating are similar for most needs and vary mainly in regard to the lecturer's table and its equipment. If rooms are to be used by several departments they should be planned in such a position that they are easily available to all. Positions at ends of blocks of buildings near staircases are advantageous, as in such large rooms with steep tiers of seats access may be needed at both ends of the rooms and consequently often at different floor levels. In smaller lecture rooms the access at both ends is less essential, and the amount of seating and height required for the tiers may be accommodated in a normal classroom or laboratory block, with the approach doors at the end nearest the lecturer.

Each student must be provided with a writing surface which should be 2 ft long. The floor area needed is at least 12 sq. ft. per student, and a little extra is desirable for those with elaborate equipment for the lecturer. The shape of the room must provide good visibility of the lecturer's table

or its full length and of any screens used for lantern slides or diagrams. Acoustics should be considered carefully when settling the main shape of the rooms. The windows should be confined to the side walls and top light avoided, as it is often necessary to provide blinds to darken the room completely in daytime. Provision has to be made for a lantern and it is now desirable to provide also for a cinematograph, which may be used at least occasionally. In some lecture theatres two lanterns may be needed simultaneously. The lecturer's desk should be as long as possible, leaving only the necessary amount of clearance at each end for easy circulation; these desks or benches are usually 3 ft wide and 3 ft high, with such services available as gas, water, electricity as are necessary for the purposes of the demonstrations.

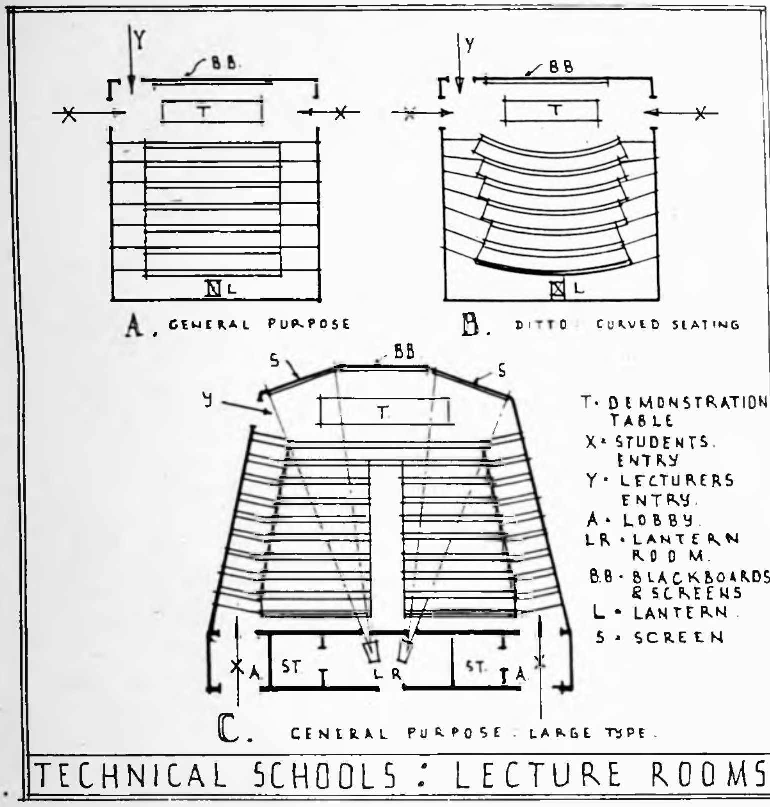


Figure 10

Figure 10 illustrates three typical lecture room plans, two being smaller types and one a larger type. The main difference between Types A and B is that the seating is curved in Type B for the improvement of vision; both of these types rely on a single entrance near the lecturer's desk and have a small rise of, say, 6 in for each tier of seats, so that the accommodation may be provided in the normal floor to ceiling height needed for other rooms, leaving head room of about 7 ft above the back or highest tier. Type B is better than Type A, but considerably more expensive in first cost. In both these examples the lantern screen is dropped over the blackboards placed behind the lecturer. Type C requires more than the normal height of one storey and consequently the main (students') entrance is at the level of the topmost tier of seats. The steppings of the tiers are of a steeper pitch than in Types A and B, being 10 to 12 in, and necessitate the introduction of intermediate steps in the gangways. Sometimes the rise of the steppings is increased towards the back of the room to improve vision. In this example the lanterns (and cinema projector if provided) are separated in an operator's box; two lanterns are shown to permit simultaneous projection, while the walls at each side of the lecturer are splayed to assist vision and at the same time leaving the centre part of the wall behind the lecturer free for blackboards, diagram screens, fume cupboards, or other apparatus. Exits are available at both ends of the room, which is essential in all larger lecture theatres. A small room adjoining the lecture theatre is desirable for the lecturer; it is essential in many cases for chemical and other scientific lectures, and for all preparatory work. Figure 11 shows the normal basic dimensions for lecture room seating; it is desirable that the seats should be made to tip up, to give easier access to seats away from gangways. Writing surfaces should be at least 15 in wide for comfort when taking notes, although they are often made rather less and at normal table height of 29 or 30 in above the floor.

Drawing Offices—Rooms for drawing, apart from those needed in art schools, are required in connection with many subjects, more especially building, architecture and engineering. Two main types of drawing office or studio accommodation are needed; first, rooms used solely for the purpose; secondly, rooms which also have to serve as normal classrooms. In the former, high tables or benches are usually provided, and in the latter

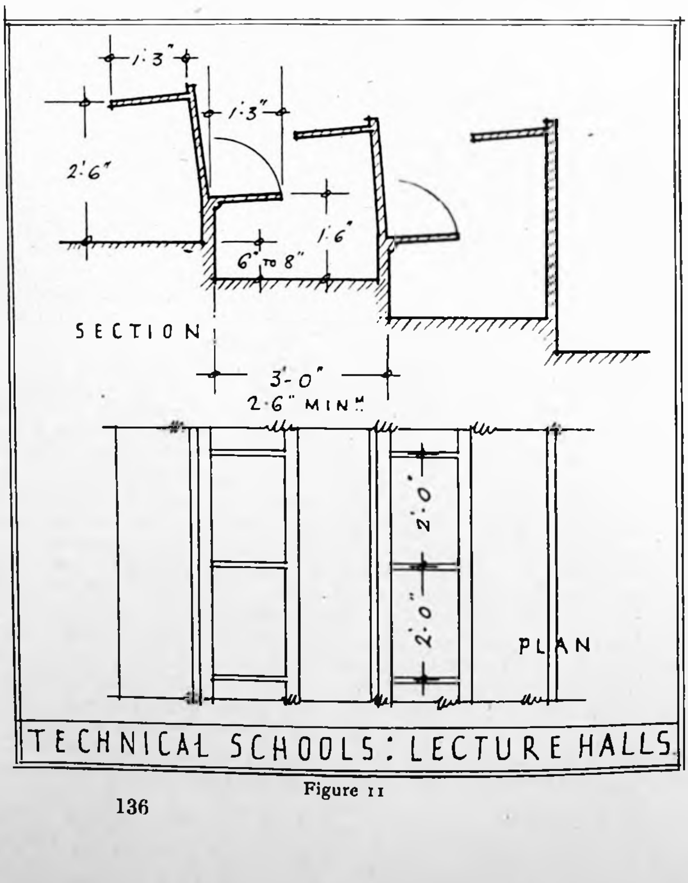


Figure 11

normal-height desks or tables have to be used, since high benches, even with stools, are not satisfactory when the room is used as a classroom. Equally, it must be realised that such accommodation is makeshift and not suitable for more advanced teaching of drawing. Junior students usually use "Half-Imperial" drawing-boards and tee-squares and two such students may generally be placed in a length of 5 ft 6 in, or even three in 7 ft 6 in. But senior students usually need larger boards (up to "Double Elephant") and more space for instruments, books of reference and drawings to be consulted, with the result that a space of 5 ft or more, according to the type of work, is essential for each student—except for architectural students, who require at least 6 ft 6 in. The width for general purposes should be 3 ft, although this is often reduced to 2 ft 3 in, which will accommodate an "Imperial" board. The sizes of drawing-boards usually used are "Half-Imperial" for junior students, "Imperial" for seniors, and "Double-Elephant" for architectural work. Gangways between tables should be at least 3 ft wide, and preferably rather more when large boards are to be used; this gangway width is controlled by the fact that students may wish to stand up when working and may need to work vertically on the long dimension of the drawing-boards. Rooms used as both classrooms and drawing studios should have tables of the normal height of 2 ft 6 in, although in some building schemes specially low tables are adopted. But other drawing tables should be 3 ft high, so that students may stand up and work comfortably; footrests are desirable on high tables. Tables usually have flat tops with blocks for tilting drawing-boards.

Good daylight is most essential in drawing studios, and the light source must be in front of the student or from the left-hand side; remembering this, it may be considered more satisfactory to place the tables parallel with the windows instead of facing towards the lecturer's table and blackboard at one end of the room. Blackboards are essential and it is usual to provide a lecturer's table or desk on a low platform, although this, perhaps, is not essential for the teaching of all subjects.

Figure 12 illustrates two methods of arranging tables in drawing offices. It should be noted that rooms of this type require very large floor areas per head of senior students if adequate table-space is to be allowed. The figures are given on the basis of 7 ft 6 in run of table per senior student. This gives an area of about 70 sq. ft. per head, but the allowance can be reduced considerably in those departments where smaller drawing-boards are used and less table-space is needed for instruments and reference purposes. For junior students or classroom purposes the same 7 ft 6 in tables will accommodate three

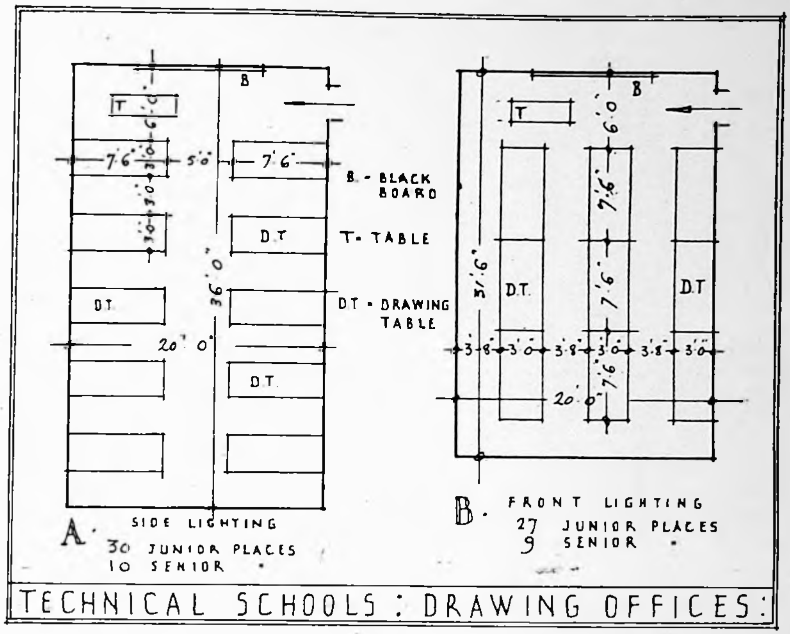


Figure 12

students (approximately 24 sq. ft. per student) and, in addition, the gangway spaces may be reduced and extra tables added to give a floor area of 20 sq. ft. per head, as is usual in general classrooms.

North or north-east aspect is desirable for drawing offices or studios; it is an advantage to have top light in addition to side windows. Diagram A in Figure 12 is based on providing light on the left of each student and Diagram B on having the windows directly in front of the students.

Ample space must be provided for the storage of drawing-boards, tee-squares and, when required, portfolios or other systems of drawing storage. If rooms are likely to be used by different classes at various times, as they are when day and evening students (both of whom may need to retain drawings fixed to the boards) are taken, the amount of space necessary for such storage is very large and it must be provided in a manner that the drawings do not become damaged. The best method seems to be the provision of racks for the vertical storage of boards inside a cupboard, which can be closed to keep as much dust away from the drawings as possible. There should be racks for each size of drawing-board used, allowing approximately 3 in from centre to centre of boards. Tee-squares may either be stored with the boards or hung by their heads on separate racks. Many departments may require considerable storage space for models and samples used for demonstration; these are best placed on shelves in cupboards, if their size will permit, so as to eliminate constant cleaning and reduce the likelihood of damage. The storage rooms are best approached out of the drawing offices themselves; it may be found convenient to plan a space, the full length of the rooms and about 8 ft wide, between two drawing offices and divide it to make one store room for each drawing office.

Departmental Accommodation—It is proposed to continue this section by summarising information relative to the accommodation necessary for the teaching of certain specific subjects; the subjects are so numerous that it will only be possible to consider those for which special provision has to be made in most, if not all, districts. Many subjects can be taught in a combination of the general rooms already outlined, so that this further information is definitely linked with special requirements for particular subjects. The accommodation will be considered in groups in the following order: Commerce, Art, Domestic Science, Building Science and Engineering.

Commerce—The work of many of the subjects considered in this group may be taught in normal classrooms as already discussed. These classrooms should accommodate various numbers of students; some rooms should be designed to seat twenty, and the remainder thirty to thirty-five. A lecture theatre or room large enough to hold at least two classes is useful. Very ample blackboard space is exceedingly important for most of the subjects, as are also large areas of wall space for charts, diagrams, pictures, etc., at a level of 5 ft to 8 ft above the floor.

Commercial subjects cover a very wide field and in many districts may represent a large part of the technical education of the students. In view of the wide scope of secretarial work, book-keeping, languages and the distributive trades, a large library or part of the main school library should be set aside for them. The specialised rooms may include rooms for

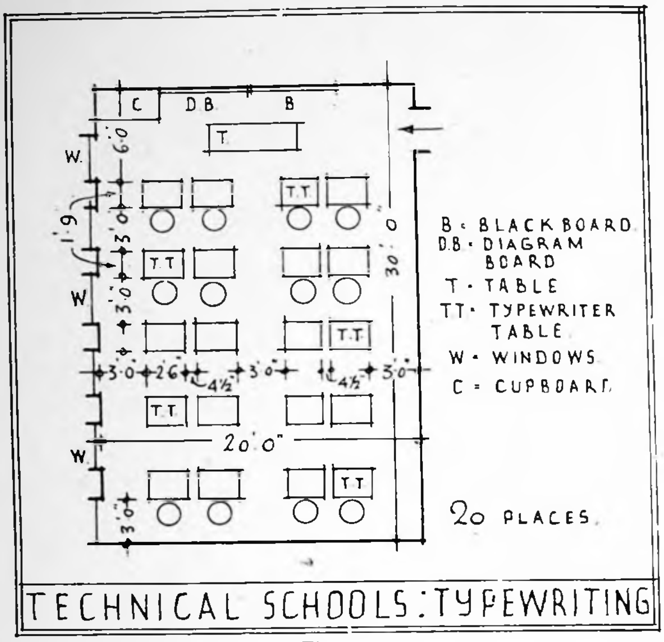


Figure 13

geography and typewriting, commodities, rooms for grocery, butchery, clothing and window-dressing, and rooms for mechanical appliances needed in the teaching of the various subjects and trades. A laboratory may be needed for the scientific side of certain trades and a studio for teaching design, colour and window-dressing crafts. Noise should be considered in placing typewriting rooms so that they do not disturb other teaching and quietness is essential in rooms for the teaching of languages. In regard to the latter, a series of small rooms, where gramophones may be used by small groups of students without disturbing one another or the surrounding rooms, may be considered necessary. Careful consideration must be taken in the design of such rooms; soundproof qualities should be ensured, but at the same time the rooms must be well ventilated.

Typewriting—A special room is usually set aside for the teaching of this subject. In view of the amount of noise created, precautions should be taken to prevent disturbance of surrounding rooms by the introduction of sound-deadening materials in the floors, walls and ceilings. Tables are usually about 2 ft 6 in long and 1 ft 9 in wide. Each student should have a separate table and, if possible, an individual source of artificial light; good left-hand daylight is also essential. Wide gangways should be planned to permit the teacher to have access to one side of every student. Figure 13 shows a typical layout of a typewriting room. (See also section: "Schools.")

Commodities Rooms—The requirements of these rooms are entirely dependent on the subjects to be taught, but generally rooms about 150 sq. ft. larger than a normal classroom are required to provide space for shelving, display work and demonstration benches. At some centres in larger cities the rooms may be equipped to represent a part of a shop for particular trades.

Window Display—When this subject is to be taught ample space for one or more typical window spaces, with special lighting, should be provided in addition to teaching space. Several benches are also needed for the preparation of large areas of paper, light woodwork, etc.

Mechanical Appliances—Owing to the increase in the use of mechanical appliances in shops and offices, a room may be needed for demonstration of such appliances as calculation machines, dictaphones, cash registers, cutters, mixers and sorting machines as used in various trades. Care should be taken to isolate the noise from these machines.

Art Departments—These departments sometimes form part of the accommodation of a technical college, but frequently there are separate schools or colleges of art in self-contained buildings. When separated from other departments they need their own administrative rooms, together with general or communal rooms, which would otherwise be shared with other departments in large schools. The principal subjects taught are drawing, painting, modelling, various crafts and, in some cases, architecture; the last is sometimes independent or linked to a school of building.

The principal rooms are studios for each section such as drawing, painting, design, life-classes and modelling, and workshops for each craft which is likely to have sufficient students to justify separate accommodation. One lecture theatre is usually adequate, except in very large departments. Studios should be placed together in a quiet position, where, for preference, north light is available; it is also advantageous in multi-storied buildings to place the studios on the topmost floor or in some other position where partial top-light may be arranged. Craft rooms, on the other hand, do not need true north-light and, since many involve noise in their use, they may be placed on noisier parts of the site, such as street frontages. The control of noise emanating from craft rooms must be carefully considered in order to prevent disturbance in other rooms. All the various craft rooms are better grouped together to facilitate the concentration and distribution of services.

Studios—General studios for drawing, painting, design and modelling require a floor area of about 1,000 sq. ft., and a height of about 12 ft. If really good side-light is available, top-light may be omitted for some of the rooms, but when circumstances permit *some* top-light should be provided. Although very large window areas are most essential, blinds for control of the light should be installed. For windows the blinds should be arranged to lift from the sill in preference to being pulled down from the window head. For general studios rectangular rooms, with windows occupying the full length of one long wall, seem most satisfactory; a width of about 25 ft and length of 40 ft have often been used, and seem satisfactory. Fixed furniture is seldom required, except in design studios and the type of equipment and furnishing is very varied. It is wise to provide facilities for hanging drawings on the walls not occupied by windows, and to arrange for blackboards and/or lantern screens; cork, linoleum or similar substances which hold drawing pins easily, are useful as wall facings from the dado to a height of 7 ft above the floor, or alternatively horizontal battens may be fixed at frequent intervals from 4 ft to 7 ft above the floor. A sink should be installed in all studios. As an alternative to the sink in the studio itself, it is an advantage to have a small sink-room adjoining the studio and entered from it, as shown on Figure 14, so that water and general untidiness may be kept outside the studio itself; this arrangement is certainly to be preferred for washing brushes in painting studios. As shown also on Figure 14 a store for work, both finished and in progress, may be planned adjoining each studio by adopting the layout suggested, while in rooms used for modelling the dividing partition may be omitted and the whole of the space of the sink room and store may then be given over to

sinks and clay bins. Figure 14 also shows the amount of top light, that is, one-third of the floor area, that is desirable in these studios ; the remaining two-thirds of the ceiling is left flat and plastered. The windows on the side walls should have a sill height of about 3 ft above the floor level. Blind-boxes in modelling rooms should be fixed at the sill level and the blinds made to draw upwards. Provision for a lantern should be made in all rooms used as general studios. Studios to be used for subjects such as architectural drawing should be designed as already discussed under the heading of drawing offices, since the benches are normally in fixed positions and the usual side-lighting is adequate.

Life Studios—These vary little from general studios, except that it is often found that a square room is the best for grouping students round the model's throne. A small dressing room or cubicle equipped with a lavatory basin, and preferably placed near the throne, is needed for the model. Local heating is required for the throne, in addition to the general heating for the room ; this is usually provided by means of electric radiators which concentrate the heat near the model and do not heat the remainder of the room more than is essential. The artificial lighting should be considered in two groups, the first lighting the model and the second lighting the students' work ; the former may be provided by means of easily adjustable floodlights near the model, while the latter should be shaded to illuminate the students' easels. Figure 15 illustrates a typical life room, with a small room for the model and a store room attached. The entrance to the life room is better placed away from the throne. In addition to side lighting from windows placed on the left-hand of the students, top-light is desirable. (See also section "Schools.")

Craft Rooms—The requirements of these rooms are largely dependent on the crafts taught and are simple from the planning point of view. Rooms having an area of 800 sq. ft. or a little more are generally adequate for the arrangement of any special furniture needed for each type of work. Very good light is of the utmost importance, as the work is often concerned with small detail. Electric power, water and gas services may have to be provided at students' bench points and at the lecturer's table or demonstration bench.

Domestic Science—This department is concerned with a wide variety of subjects, mainly or entirely for women students. The more usual subjects are cookery, dressmaking, laundry and housecraft. Apart from rooms for specific purposes, a number of classrooms are commonly needed for general subjects. It is desirable to group rooms together as much as possible and proximity of the cookery rooms to the general refreshment room (when one is provided) permits students to be taught large-scale catering as necessary for any type of institutional work.

Cookery Rooms—Small classes of about fifteen persons are most satisfactory, and rooms for this number need a floor area of 850 sq. ft. The rooms should have a north-east aspect. One room is often set aside and equipped for demonstration only, and the remainder of the rooms for the students' own work ; all rooms, and especially the equipment, should be so arranged that demonstrations may be given without undue discomfort to students. Demonstration rooms should be equipped with a gas range, an electric range, a long preparation table and behind these fittings should be placed some cupboards and shelves or racks for utensils and china, and a sink for draining boards ; seats should be raised, so that students have a clear view of the utensils when placed on the ranges.

The normal teaching rooms may be equipped in many ways. A number of work tables, ranges (both gas and electric), sinks, draining boards, cupboards and racks are required, and the ideal layout would provide one complete set or unit of equipment for each student in the manner of a small individual kitchen ; such an arrangement prevents students impeding one another's work. The general equipment, however, seems to be about four ranges, a length of work table for each student, two sinks and draining boards, cupboards and racks to be used in common by all students.

Attached to the cookery rooms there should be a larder for food storage,

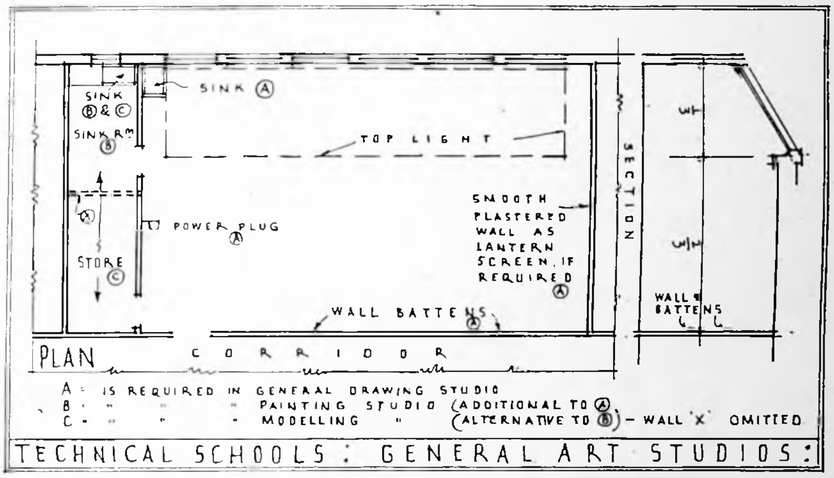


Figure 14

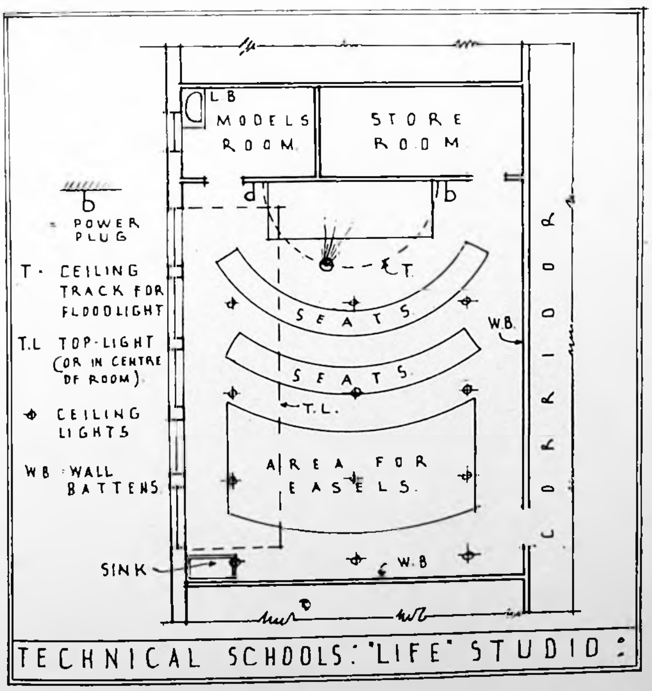


Figure 15

a pantry for storage of utensils, china and glass and a general store. The first two of these storage rooms should be of good size, and have shelf accommodation on all sides and a window, which in the case of the larder ought to have a north-east aspect. A refrigerator is generally needed and may be placed either in the cookery room or in the larder. Larders and pantries should lead directly out of the cookery rooms. Some schools provide a small room adjoining the cookery room and connected by a serving hatch for teaching the serving of meals ; this room may often form part of the housecraft accommodation. (See also section : " Schools").

Needlework — Needlework rooms for teaching dressmaking and millinery are generally about 850 sq. ft. in area and should have fitting rooms with an area of 150 sq. ft. attached. Frequently a small annex is provided to serve as a lavatory and equipped with several lavatory basins with hot and cold water. When several needlework rooms are provided it may be found advantageous to place the fitting room or rooms between two main teaching rooms and divided from them by movable partitions as shown in Figure 16. Then one large room can be provided for lectures or special demonstrations.

Laundry—This subject requires considerable space per student and for a class of twenty-four an area of 2,000 sq. ft. should be provided. One large room will accommodate all the apparatus necessary, but the space is sometimes divided into two, connected by drying and airing rooms. One part should contain all the washing equipment and the other the ironing, finishing, folding and packing apparatus. The type and amount of equipment varies according to the importance of the subject in the general training.

Housecraft—Some schools provide typical domestic rooms for use in conjunction with the teaching of this department ; similar rooms are discussed in the section on " Schools."

Other Rooms—Rooms may be required for teaching such subjects as upholstery, curtain-making, household repairs and similar trades. They should have an area of 750 sq. ft., with large storage accommodation for work partly finished, materials and spare tools ; in addition to work tables, cupboards, racks and drawers are needed for tools and materials in use Except in very large domestic science departments, special art rooms and science laboratories are not provided and use is made of rooms in other departments.

Building Department—This department is likely to be needed for day and evening students and often requires a very considerable area. In addition to the actual workshops necessary for each trade in building, classrooms, drawing offices, laboratories, large storage spaces and a museum are essential. Architecture forms part of this department in many schools and for this subject various extra rooms, principally studios, have to be provided. The trades for which workshops are required include carpentry and joinery, plumbing, bricklaying, masonry, plastering and painting and decoration. Cabinet-making, although sometimes treated as a separate subject, often forms part of the building department.

It is desirable that all workshops should be grouped together and placed in such a position that the noise emanating from them does not disturb other rooms. They are best placed on the ground floor, and it is generally an advantage to arrange them as a single storey block which permits of the introduction of top light as well as side windows. Road access is of importance for deliveries of heavy materials. It has been suggested that workshops might be planned round a large and high room which can be used for the erection of large samples of work, even small buildings or portions of buildings.

Classrooms and drawing studios have already been discussed in general accommodation.

Building Science—A special room is likely to be required for this purpose. It must be part laboratory, part clear space for large testing equipment and apparatus, while some portion of it, or an annex, must be set aside for the storage and mixing of materials and use as a balance room. An area of 1,000 to 1,200 sq. ft. is ordinarily sufficient for the average class in this subject.

The room should be equipped with flat-topped tables 2 ft 6 in wide and 2 ft 9 in high. These may be used either for experimental apparatus during lectures, or even for drawing. The tables should be placed on one side of the room, leaving only sufficient space for a fixed bench, sinks under the windows and a gangway. In this way as much area as possible is left clear on the side away from the window for machines and apparatus, as shown in Figure 17. The fixed bench under the window should be equipped with gas, water and electricity.

An adjacent small room should be equipped with shelves for mixing samples and a sink and bins for materials such as cement, sand and plaster, but not for bulk storage. A room attached to this laboratory, to be used as a permanent exhibition of building materials, is very useful.

Carpentry and Joinery—Workshops for this subject are, as a rule, planned for about 20 students, and should be equipped with double benches 6 ft long by 2 ft 9 in wide, with an assembly table 10 ft long by 3 ft wide. Tools and small work in progress are stored in lockers under a portion of the benches, but larger work must be stored in cupboards or in a small store room attached to the workshop. An area of about 1,200 sq. ft. is needed for 20 students. A timber store should adjoin the workshop and must permit of handling long lengths of timber.

A machine shop is sometimes required as a separate unit. In smaller schemes space for a limited number of machines must be allowed for in the workshops. Wood block floors should be provided throughout. Gas or electricity is needed for glue heating ; electricity is generally used for driving the woodworking machines. The machine shop does not need as much floor space as the workshop and a floor area of 750 to 800 sq. ft. may be enough. (See also section : " Schools").

Plumbing—For normal classes a workshop having an area of about 1,000 sq. ft. is needed. Wall benches 2 ft 6 in wide should occupy a portion of the walls ; the remainder of the students may be accommodated at benches, allowing 3 ft 6 in of length per student. The benches should be 3 ft 6 in wide, to allow students to work on each side, and 2 ft 6 in high. A large store is needed adjoining the workshop for storage of work in progress and large sheets of material.

Plastering—A room having an area of 750 sq. ft. will accommodate 15 students comfortably. North-light and good wall access for teaching plastering are both desirable. Benches should be 2 ft 6 in high and 4 or 5 ft wide. One large bench may be needed for setting-out and cutting moulds. Bins for

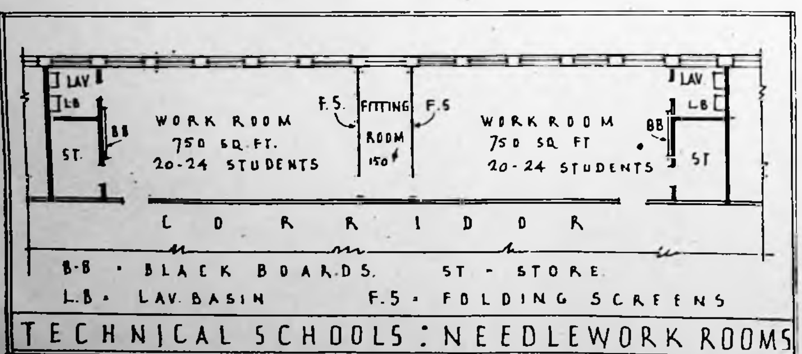


Figure 16

materials and cupboards for tools are necessary. Cubicles are often built to represent small rooms for practice in plastering work; to eliminate scaffolding, these cubicles should have low ceilings. Water supply and sinks and gas for heating gelatine, are essential.

Brickwork—A normal class of 15 students requires an area of about 750 sq. ft. Most of the work is built on the floor, which should be of granolithic or some other hard material. A few benches are needed for cutting and rubbing and some wall benches 3 ft wide, allowing 4 ft run per student, for "guaged" work. A large store is needed for materials, with a part set aside for mortar mixing.

Painting and Decorating—Most of the work is done either at fixed benches or on easels. Benches should allow 4 ft 6 in length per student and should have a width of 2 ft 8 in; double-sided benches are sometimes employed, but single-sided ones are better. A brush trough about 5 ft long by 2 ft wide is essential, and a sink with hot water is needed for brush-washing. As a rule a dustproof cubicle is also required.

Masonry—A room having an area of 750 sq. ft. will accommodate 15 students comfortably. Large tables are needed for setting out, and "bankers," 3 ft by 2 ft, for the actual working. Power machinery may be used in some schools; the area is governed by the number of machines considered necessary.

Cabinet-making, etc—A shop similar to that needed for carpentry and joinery, together with a small amount of machinery, is usually required; single benches are desirable.

In some districts cabinet-making in all its branches may need a large department of its own to provide not only for cabinet-making proper, but also for carving, veneering, polishing, upholstery and even chair-making. Veneering may be taught in many schools, since it plays an important part in both joinery and cabinet-making to-day; considerable space is needed to provide for glue tanks, veneering presses, cutting tables and a special veneer store.

The polishing workshop should provide for one or two spraying chambers as well as benches for hand work; the combined area needed for a well-equipped workshop for 20 students is 1,200 sq. ft. Carving only requires a small area per student, and a general allowance of 30 sq. ft. will be found adequate. Each student requires 3 ft 6 in length of bench 2 ft 6 in wide, and preferably against a wall. Upholstery needs a much larger area, as some machinery is generally installed and several large tables are necessary for planning and cutting out. One wall should be equipped with a series of dummy windows of different types and sizes for exercises in curtain and pelmet work.

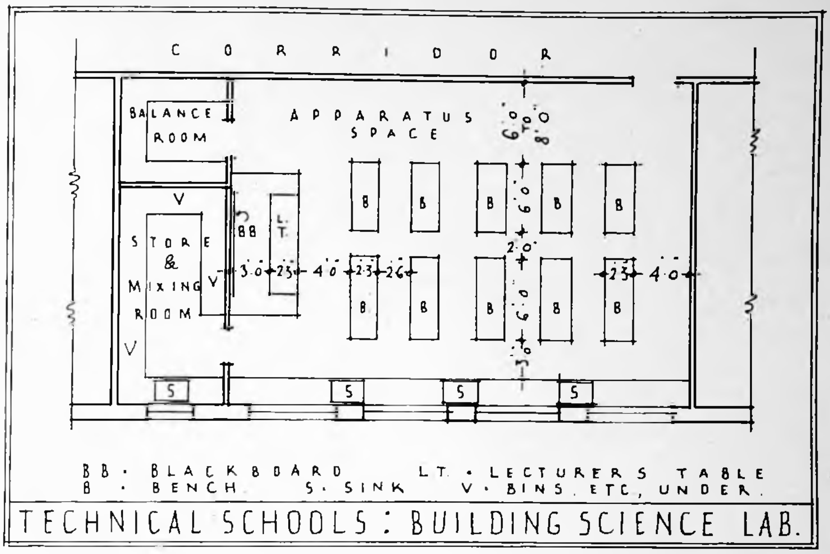


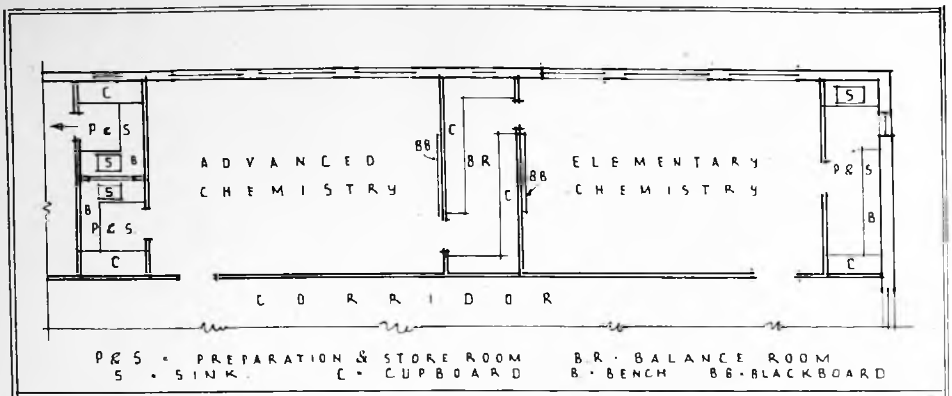
Figure 17

Science Department—Dependent on the type of school or college, this subject may be sub-divided into many groups, such as chemistry, physics, pharmacy and metallurgy and each group further sub-divided into more specialised groups. These subjects may only form minor needs of various other departments, or may be complete departments in themselves. The main space requirements are classrooms, lecture rooms and laboratories, each fitted to provide for the teaching of a particular sub-division of the subject, together with the necessary preparation rooms and research rooms.

There are two main positions in a technical school for the chemistry and similar departments; the first, ground floor level, where the problem of handling a very complicated drainage system may be controlled more easily and the second a top floor where ventilation is more easily provided efficiently. Lecture rooms, of which several are likely to be needed, are similar to the general lecture room already described, except for additional specialised apparatus, such as fume cupboards and extra services. Chemistry lecture rooms should have a preparation room, with an area of about 400 sq. ft., adjoining; the equipment should provide a bench with all services, glass-fronted cupboards and a sink with hot and cold water.

General Laboratories—The average laboratory for general purposes requires a floor area of 1,000 sq. ft., which will accommodate about 30 students. For some subjects this area may be reduced a little but for many others rather more space is often desirable. Very good light is necessary, and when the plans will permit the addition of top-light or light from two sides of the room is advantageous; cool aspects are preferable.

The planning does not present many difficulties other than those involved in the provision of certain complicated services such as drainage, ventilation, gas and electricity. The floors need special consideration, as the drainage is generally in the form of deep, open earthenware channels below floor level with removable floor coverings. Artificial ventilation is almost essential and it should be provided in a simple manner, but at the same time, metal ducts which may be subject to corrosion, should be avoided. Benches are usually 3 ft high and often double-sided, unless the rooms are to be used for formal lectures. Sinks are needed between every two students in chemistry laboratories, but less frequently (if at all) in laboratories for other science subjects. The detail design of benches and shelves is entirely dependent on the particular use of each laboratory; benches should provide at least 3 ft 6 in run per student. Each student should have a locker, which should be at least 18 in wide, 15 in high and 15 in deep, for storage of apparatus; these lockers may be under benches in laboratories used by a limited number of students, but in most schools, particularly those with evening classes in addition to day students, the number of students using each room necessitates the provision of sets of lockers in positions other than under benches. Many laboratories need special benches or fittings in addition to the demonstrator's bench and normal students' benches. Such fittings include drying ovens, fume cupboards, combustion benches and washing-up benches; the latter are usually provided as wall fittings. Benches for general and inorganic chemistry, pharmacy and physics as a rule have teak tops, but for organic chemistry lead-covered tops are often provided.



TECHNICAL SCHOOLS: TYPICAL LAYOUT OF CHEMISTRY LABS.

Figure 18

Organic chemistry requires a fire-proof cupboard and a combustion bench with a concrete top; for physics much clear space on walls and floors is necessary. Benches in chemical laboratories should be fixed, but in laboratories for other subjects are often made movable. (See also section: " Schools.")

Balance Rooms—These rooms must be planned so that they are readily accessible to all students. An area of 250 sq. ft. is required. The room is usually long and narrow; exceptionally good light is essential, preferably from windows facing north. The shelves on which the balances are placed are best made of slate or stone and should be 18 in wide and 3 ft above the floor. So that students may sit back-to-back and leave a clear gangway, there should be at least 7 ft between balance shelves on each side of a room.

Figure 18 illustrates a typical layout of the laboratories in a small chemistry department. The two laboratories, one for elementary and the other advanced students, are placed on each side of a balance room accessible from either. There is a preparation room at each end of the unit. Blackboards and demonstrators' benches may be placed at either end of the rooms as thought desirable by the teacher in charge, who may then control and be close to the preparation rooms if he wishes. Alternatively, the students may have freer access as shown on the figure.

Figure 19 illustrates a typical suite of physics laboratories. Each laboratory has a preparation room and a dark-room accessible from it; the preparation rooms in this case do not need such large areas as those for chemical laboratories and are here shown grouped together between the two main rooms.

Store Rooms—Considerable storage space is necessary in science buildings for the storage and issue of chemicals and apparatus to students and the bulk storage of materials and large apparatus. External storage may be needed for inflammable materials.

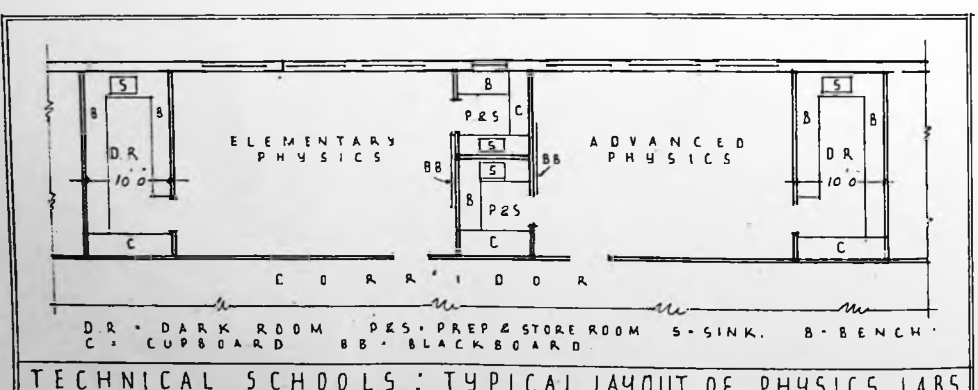
Research Rooms—Some institutions may require a number of small laboratories for research work. Rooms having areas of 150 sq. ft. upwards should be equipped with fixed wall benches and central movable tables.

Dark Rooms—For physics departments dark rooms are needed and should be placed where they are easily accessible from the laboratories. These rooms should be about 10 ft wide and should allow 8 ft length of bench per student. Wall benches are usual, and at least one sink should be provided.

Engineering Departments—The work likely to be covered by these departments varies considerably and includes a very wide range of subjects such as civil, mechanical and electrical engineering, geology and metallurgy. In addition, access to laboratories for closely allied studies such as physics and chemistry must be available. Much of the work of many engineering departments may be taught in classrooms, lecture rooms and drawing offices as already described, but laboratories and workshops are necessary in addition. The use of engineering plant and machinery may evolve considerable noise and care must be taken to isolate classrooms and lecture rooms from disturbance.

The requirements for engineering subjects are so varied that the precise needs of each room must be laid down for each individual building by the promoters of the scheme. Any general information such as could be given in this book would be of little value.

Other Departments—As already stated, buildings or departments are required in different localities for the teaching of special technical subjects. But as many of these are called for only occasionally, the authors do not feel that the detailed planning is of sufficient general interest to warrant inclusion.



TECHNICAL SCHOOLS: TYPICAL LAYOUT OF PHYSICS LABS.

Figure 19

7. *Community Centres*

Introduction—The general conception of community centres has changed in recent years and much greater and somewhat different developments will take place in the future if the schemes now being fostered through both official and voluntary channels mature.

The basic aim is well summarised in a book, "Community Centres," by Air Vice-Marshal Thorold and E. G. Farrow (Home and van Thal Ltd., London, 1945), which states "it is to create in the community centre the positive instrument to promote culture and to encourage harmonious and balanced living, so that the individual finds purpose and achieves self-expression in service to the community and learns to live a fuller life."

The activities therefore for which community centres have to cater are very numerous and even more diverse. In the past some of these activities have existed in our towns and villages and have centred on the village hall, or have been associated with religious bodies, adult schools, sports clubs, boys' and girls' clubs, political clubs and even the public house. In each case however, these activities have been somewhat disassociated, often by "class distinction" based on income, seldom brought the varying age groups together and often separated the sexes unnecessarily. Although many of these activities have been carried on in one form or another in the past, the present interpretation placed on "community centres" has changed very completely and at the same time the need for centres is constantly growing in both urban and rural areas. The need is undoubtedly greatest in the areas where new housing schemes are contemplated and where no facilities exist for recreational, instructional and religious purposes; but there is equally a demand for such organisations in many existing towns, especially those which grew rapidly between the wars, and for which buildings were not planned or in many instances suitable sites were not allocated. In rural areas the need may be considered by some to be less important than for urban areas for various reasons, such as the widespread population and the fact that country dwellers have more to occupy their leisure time, but if rural life is to be made attractive, facilities similar to those in urban areas are of equal importance to foster the life of a community.

Increased leisure is one of the aims of today and the future, so that facilities to use this leisure become of increasing importance. Many forms of activity need accommodation not available in the home, while others are of an educational type which necessitate communal buildings. The main aim therefore in the planning of community centres should be to provide for neighbours to get together for social, recreational and educational activities on an equal footing.

An extremely valuable report on the whole subject was prepared by the Ministry of Education in 1944 entitled "Community Centres" (H.M.S.O., price 9d.). This report provides much information on the need, aims and methods of providing the necessary accommodation. Much work in this field has also been promoted by the National Council of Social Service, which includes community centres as an important part of its activities; it assists with literature, general and even financial assistance, the organisation of community centres. The same body has issued a number of helpful publications on the organisation of community centres and village halls.

The Miners' Welfare Commission provides similar centres in mining communities with funds derived from the Miners' Welfare Fund.

Legislation—Local authorities for higher education are given powers by Section 86 of the Education Act 1921 as amended by Section 6 of the Physical Training and Recreation Act 1937, to assist with setting-up and financing community centres; Section 80 of the Housing Act 1936 confers power on local authorities, with the consent of the Minister of Health, to provide and maintain buildings and recreation grounds in connection with the requirements of persons for whom housing accommodation is provided. The Education Act 1944 in Sections 41 and 53 requires the provision of facilities for further education, and for recreation and social and physical training. By this legislation local authorities may thus assist the provision of community centres with buildings and with the cost of staff and maintenance. Already these facilities have been used in a number of areas, but so far to no very great extent.

Sites and Siting—The needs of urban and rural districts require to be considered separately as the conditions are likely to be somewhat different, the rural areas must collect patrons from a fairly wide area, possibly amounting to a radius of as much as five miles and consequently the site should form part of a group of main buildings in the chief village or small town of the area, but they must be in such a position that reasonably good transport facilities are available; the provision of suitable parking space for motor cars and ample storage facilities for bicycles are most essential.

In urban areas the community centre should not serve a population greater than 10,000 persons; thus, in large urban areas, a series of centres should be planned, one in each main residential neigbourhood with a main centre forming part of the town central buildings or civic centre. In this way the neighbourhood buildings will be reasonably close to the houses of the users and sites will need a less close relationship to public transport and less facilities for car parking.

Site areas are very difficult to recommend as they must of necessity vary with the conditions to be met in each district, but wherever possible the site area should be such that considerable future extension of the buildings is easily possible, as this may quickly be needed if the scheme is successful.

The site must be accessible to the whole area it is to serve, and should be grouped with other recreational and social services, sports centres, and with schools, especially if these may advantageously be used in conjunction with the community centre. Some advantages, such as economy of buildings, use of gymnasiums and availability of specially equipped teaching rooms, may be obtained by grouping community centres with educational buildings, but there is a risk that an unhappy psychological effect may arise from the feeling of a "return to school," especially among young people, if the school buildings themselves are used; in addition, there is the difficulty that schools are not furnished or equipped for adult education and this may prove a great inconvenience, although it will, in a measure, be changed when "Village or County Colleges" envisaged in the Education Act 1944 are built, as these will be adequately equipped for semi-adult pupils.

Sites adjoining main traffic roads or railways, from which considerable noise may emanate, should be avoided and if this is not possible every effort should be made in planning the buildings to screen those parts of the scheme where undue noise would be a nuisance as in teaching rooms and halls used for music or dramatic performances.

It is an advantage to have the site of an area that will permit of the planning of gardens to form a pleasant setting and also as an extension of premises for events such as "sales of work" and "fetes." There are also possible advantages from the grouping of the community centre with communal playing fields, as some of the

community buildings, such as the canteen and changing rooms, might be used for dual purposes.

If sites adjoining playing fields are used they will generally be fairly level, but this is not a necessity for the majority of schemes and, in fact, rising sites are often to be preferred, especially if there are views to be had from terraces or gardens. The proximity of water, such as rivers, streams or lakes add greatly to the amenities of the surrounding lay-out and gardens, so that when such natural assets are available very full consideration should be given to them when choosing a site.

Figures 1 and 2 illustrate village centres, which are usually small schemes, on typical sites. The one has a wide frontage and shallow depth, and the other shows a narrow frontage. These figures illustrate in particular the relationship of the buildings to the street and also the arrangement of car-parking facilities. Full information regarding the parking of vehicles given in the section on "The Motor Vehicle." Covered storage for cars will seldom be needed except in very large schemes or when a single car garage may be wanted for the warden. The details for the provision of storage facilities for cycles are given in the sections on "Schools" and "Factory Buildings" and similar provisions will apply to community centres. Parking for perambulators will be needed if there is a clinic or clubs to which mothers are likely to be members; such parking must be under cover, and information is given in the section on "Schools" under the heading of nursery schools.

The scheme shown in Figure 1 has the entrance on the side of the hall and a grass space in the front of the building, while the car park occupies the remainder of the site. In each example a small enclosed yard is provided adjoining the kitchen; this is useful for open-air storage and for the screening of any untidiness of approaches to basements and fuel stores. In Figure 2 the main entrance is placed at the end of the hall. One side of the hall is used as a parking space and the other as a grass area with approaches from the hall. Hedges are to be preferred to fences, especially in rural areas, as they are more pleasant in appearance, but boundary walls of brick or stone may be used in districts where they are customary. Flower beds, although attractive, necessitate upkeep and are liable to damage if the grounds are at any time crowded; they should be used in moderation and with careful placing. Trees should be preserved whenever possible, while tree planting is a useful aid to the general setting of the buildings so long as care is taken in placing to avoid overshadowing of windows. Yards and main approaches should be paved and properly drained for dryness and cleanliness. The diagrams are not intended to show the proportional areas required for village centre sites but the general principles of lay-out. Larger site areas are desirable in even the smallest schemes.

In larger schemes approach roads and car parks should be carefully separated from gardens and when possible the buildings should screen the one from the other. Car parking must be placed in such a position that vehicles may drive up to the main entrances, particularly that of the assembly hall and continue without difficult turns and without reversing into car parks.

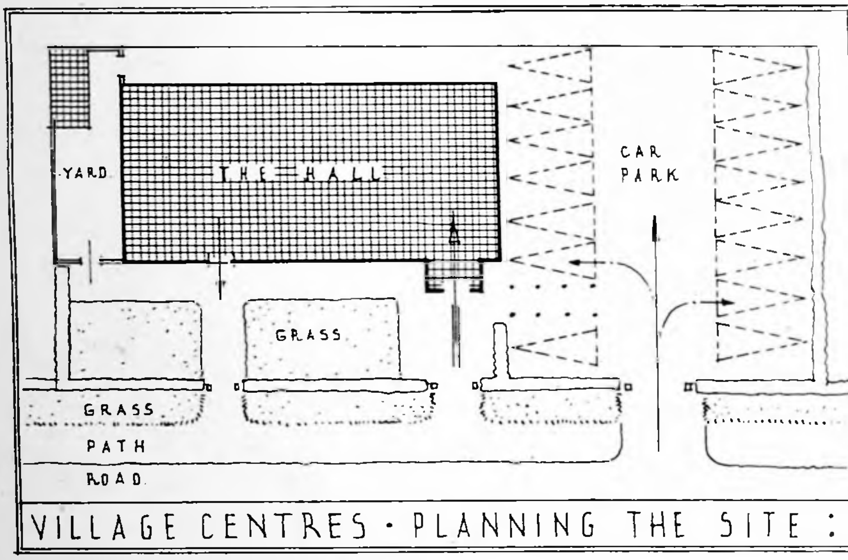


Figure 1

Types of Centre—Throughout this section a number of terms are used to describe various sizes of centre. "Village centres" is used to describe the smallest types, which may be merely a small club where the population is quite small; and in slightly larger villages they are likely to be small halls with a few additional rooms used for a variety of purposes. "Community centres" is generally applied when referring to the larger types for larger villages, towns and small cities. Similar centres are likely to be used in "neighbourhood" units of large towns and cities and where, in addition, there will probably be a main centre at which the most important functions of the whole urban area will take place.

Village, town or county colleges are not covered in this section, although these may be very closely associated

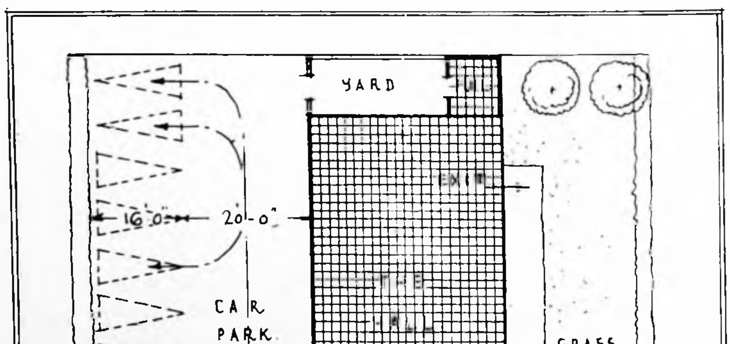


Figure 2

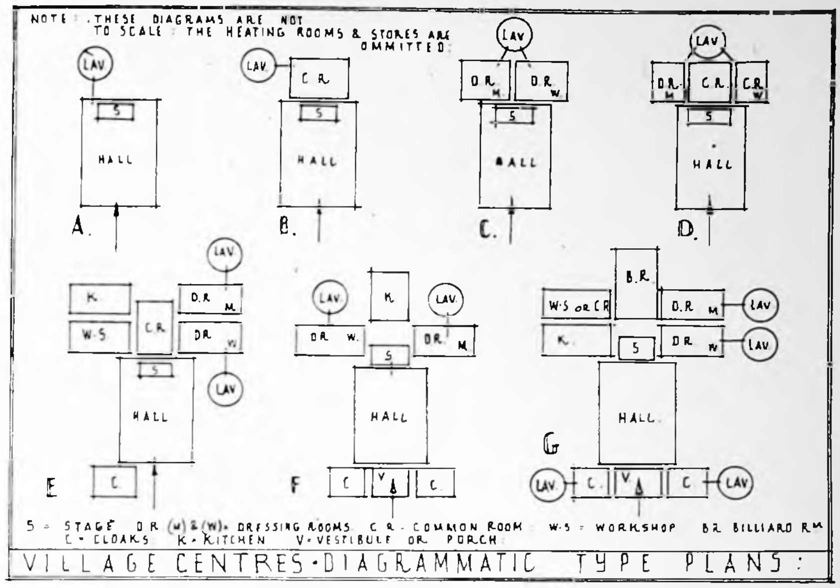


Figure 3

with community centres in many instances, and certain accommodation may be used jointly for both purposes as a general economy in the provision of buildings.

The term "youth centre" is also used where it is desired to distinguish parts of centres or whole centres devoted to the activities of young people from those used by the main adult population of an area or unit.

Activities—As already suggested, the uses to which parts of community centres may be put are very diverse; they fall into three main groups, although each tends to be closely related to the whole and many fall within two groups. These three main groups are social, recreational and educational. The social group includes activities such as dances, whist drives, concerts, dramatic performances, together with simple club and common room facilities; the recreational group covers activities such as physical training, badminton, table tennis and various clubs, such as poultry and allotments; the educational group provides for reading and for classes ranging from cookery and carpentry to economics and languages. It is usually necessary to consider all the activities in relation to age groups, as some will only interest the relatively young while others will draw members of all ages; it may therefore be necessary in many schemes to plan the buildings in two or more groups, thus separating youth usages from general activities.

Centres may include a library, which will often be a branch of the town or county library organisation; also, it may be a convenience to incorporate a clinic as part of the buildings for mothers and infant welfare, or even for entire family medical welfare.

A canteen is of great value, not only for refreshments on special social occasions, but also for daily use in connection with all the activities; it should be adequate for serving light meals, and not only "tea and cakes," except in the small village centres, where daily use may not be possible.

Accommodation is needed for the staff and will be dependant on the number and type of staff employed; in many schemes the staff may be little more than a warden and a caretaker, with the possible addition of a steward; other schemes may need a large number of staff of varying types, whereas the small schemes can probably manage to support little more than the part-time services of a caretaker. It can, however, be generally assumed that, with the exception of resident wardens or caretakers, the various types of staff employed will be non-resident or part-time and that living accommodation is not required.

The following are some of the activities catered for in various community centres and village clubs, but a complete list would be too large to set out in this series of articles. Cinematograph performances, exhibitions, amateur dramatics, dances, indoor games (badminton, billiards, cards, chess, table tennis), physical training and gymnastics, boxing and fencing, boy scouts, boys' brigade, girl guides, youth clubs, continuation classes and adult classes (covering many subjects, especially handicrafts), mothers' meetings, mothers' unions, women's institutes, sewing circles, sports clubs and clubs for various sectional interests (photography, bee-keeping, poultry, young farmers and gardening).

General Lay-out—The types of community buildings fall into two main groups. Firstly, the type that consists principally of a large hall, which may serve a variety of purposes and having one or two rooms only attached to it. Secondly, the type in which the main hall or halls represent only a small part of the total scheme. The first type is mainly represented by the village hall, which is applicable to smaller communities, whereas the larger type is typical of the needs of neighbourhood units (up to 10,000 people) and community units (up to 50,000 people) of large towns or cities.

Figure 3 illustrates a number of diagrammatic lay-outs of village centres, with varying numbers and types of rooms attached. Occasionally a hall is built without any additional rooms, as shown in Type A; such a hall may serve a number of duties in a small rural area, principally as a village club, but the provision of at least one additional room, as in Type B, makes a building more than doubly useful. Theatrical performances are impossible without the extra accommodation. Type B is a very simple type of layout without cloakrooms at the entrance, but with a large committee or common room at the back of the platform, with lavatory facilities attached. Type C has the committee room shown in Type B divided into two rooms, each with lavatory attached and thus provides for two organisations to use the building at one time, or provides a dressing room for each sex. Kitchen facilities on a small scale are useful in one of the two rooms. Type D has three rooms behind the stage, one of which is used as a kitchen, leaving the other two as committee or dressing rooms; this arrangement of rooms is specially useful, as the kitchen may be used in conjunction with the hall, or either of the other two rooms, without disturbance to the uses of any of the other rooms. It is not very pleasant to have the kitchen equipment placed in a room frequently used for other purposes and may at times prove very inconvenient. The type shown in Diagram D should normally be considered as the minimum accommodation desirable in even the smallest community. Type E shows a larger scheme; there is a cloakroom provided at the entrance to the hall, but without lavatory accommodation. This arrangement is usually adopted for cheapness and is not, of course, as efficient as that shown in Type G, where there are two cloakrooms, each with a lavatory, thus serving the two sexes. However, the scheme is adequate for many local uses, as frequently the retiring or committee rooms behind the platform are not in use at the same time as the main hall, for example, when dances are held and one of the rooms behind the platform is used as an additional cloakroom. Type E has also two retiring rooms leading from the committee or common room, which may then become the "green room" and scenery store for theatrical performances and at other times may be used for separate organisations such as for scouts, the library, etc. Adjoining the kitchen in this scheme is an additional room, which may be used either as an extra committee room or some special purpose such as a workshop for teaching handicraft work,

or as a clinic, when it could be suitably fitted up for the purpose.

In Type F the two dressing-rooms are planned to be separate, unlike those in Type E, which makes them more useful as general purpose rooms than when approached by way of the main committee room. The whole lay-out is rather simpler, and eliminates the two rooms which are provided as extra space, than Type E, which is in consequence a more expensive building.

Type G shows the addition of a large room to the scheme and is therefore more or less a combination of Types E and F. Such a room might be used for billiards or as a general games room. Type G also shows the full cloakroom, lavatory and vestibule needs at the entrance to the hall. If required, a cinematograph or lantern projection room can be planned over the vestibule, with a tiny staircase leading to it and used also as an escape. In all the types shown in Figure 3 the hall may be used for many purposes, such as dramatic performances, dances, a gymnasium, or a general club room ; it might also be sub-divided by means of screens or folding partitions into two smaller rooms approached from each end of the building, although at times this arrangement may prove to be very inconvenient. The smaller rooms in all schemes are also likely to be used for a wide variety of purposes, such as small club rooms, as dressing rooms for theatrical performances, committee rooms or consulting rooms and if the building is used for maternity or infant welfare the main hall may have to serve as a club room and waiting room.

Figure 4 shows an analysis of larger types in which the halls become relatively less important than the rest of the accommodation and in fact if the community centre is grouped with a school, it may be possible to avoid the expense of the provision of the main hall and concentrate on the provision of a smaller hall, which would be adequate for larger club meetings, although inadequate for larger meetings or social events. In the schemes indicated on Figures 3 and 4 there is no reason why portions of the buildings should not be two stories in height, especially as the hall needs to be reasonably high to permit of a suitable stage construction or for indoor games such as badminton, or if a gymnasium is provided, as this also needs a height permitting of two stories for the other rooms. Care should be taken that the small rooms in smaller schemes are of adequate size for the purposes for which they are intended, especially if space is occupied by cupboards or lockers for each club or group using the room.

Figure 5 illustrates in diagrammatic form the essential relationships of a large community centre for an area having a population of from 5,000 to 10,000 persons. The scheme is based on two entrances, the one primarily serving the whole building and the other leading directly to the halls, as it is essential to arrange that as many parts of the group as possible can be used simultaneously. It should be noted that the cycle and perambulator stores are related to the main entrance of the building, whereas the car-park is more closely associated with the entrance to the halls.

Related to the main entrance to the community centre are generally cloakrooms for both sexes but a separate group is allotted for the use of visitors to the halls. Associated also with the main entrance are the rooms most generally used, such as the common room, library and reading room and general-purpose rooms. The warden's office should also be near the entrance, but his quarters, if he is resident, may be on an upper floor. The games and group activity rooms are planned together with such small rooms as may be needed for "leaders." Teaching rooms should be grouped together and, except for craft rooms such as carpenters' shops, may be planned, if required, on upper floors ; care should be taken when placing teaching rooms to avoid positions where noise from games rooms may be disturbing. The gymnasium with its changing rooms may be and is generally better treated as an independent unit.

The kitchen and canteen should be so planned that it serves as directly as possible both the common room and the main hall. The main hall, although often treated as a semi-independent unit, should be accessible from the remainder of the buildings under cover. The small hall may either be associated with the main hall or form part of the other accommodation of the whole group.

Future Extensions—It is of great importance that buildings designed for use as community centres should be so planned that future extensions may easily be made, as the money available at the commencement of schemes is likely to be limited and moreover, as the centre increases in popularity, many more activities are likely to need accommodation.

There are many types of plan which may be adopted whereby future extensions are made easy, more particularly, in the case of bigger schemes, those which are planned to produce ultimately a courtyard plan type as illustrated in Figure 6.

Walls of single story buildings can also be constructed so that one or more additional floors may be added, but in order that this may be possible consideration should be given to the placing of future staircases in positions which will not spoil the planning, or make the ultimate circulation difficult. It is, however, generally agreed that horizontal extensions are better and less disorganising than vertical extensions.

Figure 6 illustrates two plan arrangements on which future extensions are indicated. Type A is based on forming an open courtyard scheme when the buildings are completed, whereas Type B has an enclosed courtyard. Both examples suggest that a main hall and a few rooms form the basis of the scheme in its first stages, but it may be considered that other activities are of greater importance when the scheme is commenced, or alternatively a hall may be available in an adjoining building, such as a school and, therefore, the large hall will be better provided as part of the future extension. Car parking should be arranged in such a position that the area is not too small for use when the extensions have been carried out.

Type A of Figure 6 takes as the "basic building" a hall with a stage and dressing rooms which may be used for various purposes, placed on each side of a main corridor. Entrances are placed at each end of this main corridor in the first building and, as the building is extended, the one near the stage of the hall may be used mainly to serve the committee, club and work rooms ; the other, which is near the street frontage of the site, then becomes the main public entrance to the

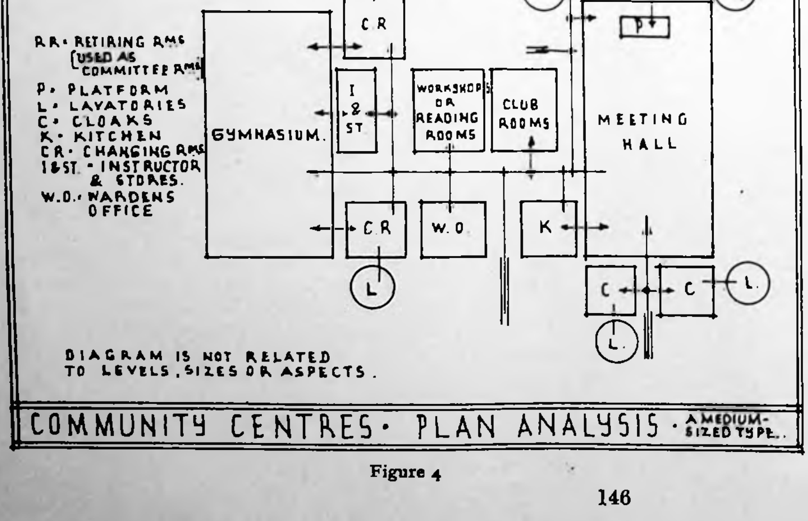


Figure 4

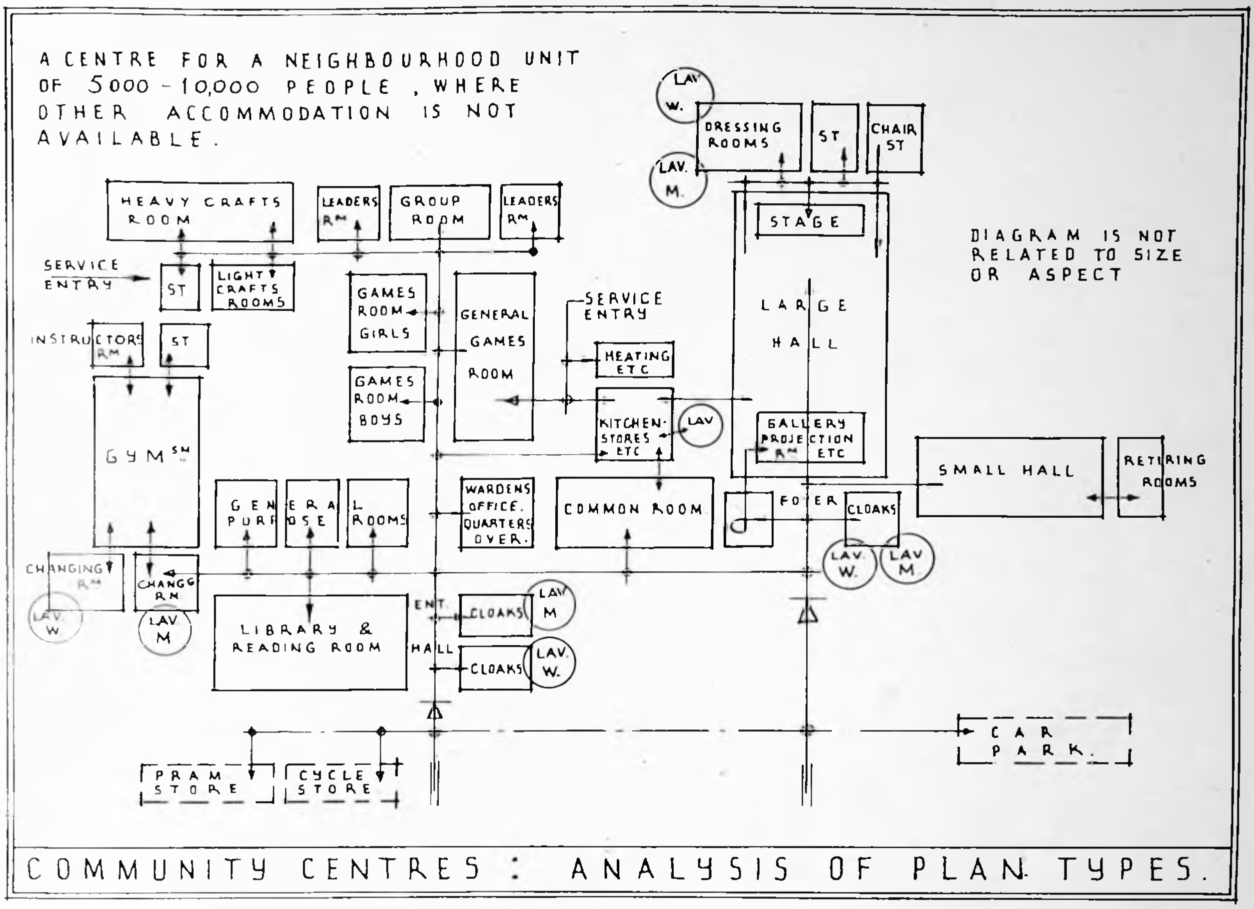


Figure 5

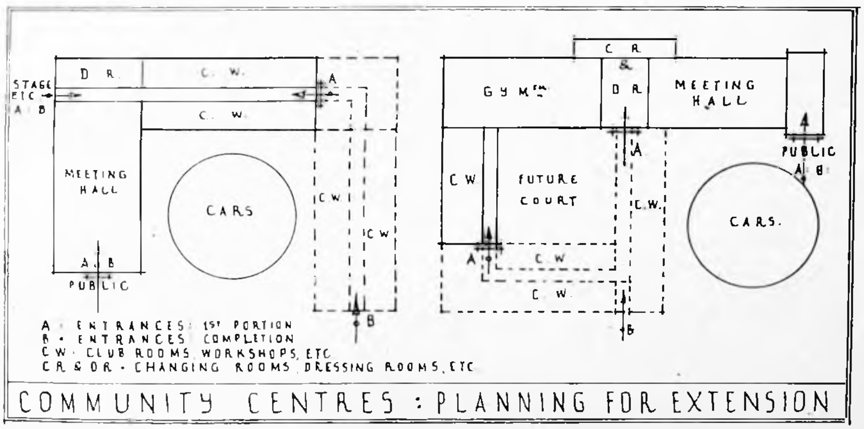


Figure 6

whole building, thus leaving the hall as a more separate unit, complete with its entrances and exits, so that it may be used independently from the remainder of the building.

Type B suggests a commencing scheme comprising a hall and a gymnasium with joint dressing and changing rooms, together with a few rooms for general purposes. The entrance for the main hall remains the same, but those for the remainder of the building move to other positions as the scheme is extended, and ultimately come under one control. Both of the schemes shown are capable of much further extension than is suggested on the figure, by the addition of wings projecting on each side if the site area permits. The possibility of future extensions affects the planning of the first portion of the building very much and a future extended scheme should be drawn up before any preliminary building decision is made.

Entrances—In smaller schemes the main entrance usually leads directly to the hall, with a subsidiary entrance to the group of small rooms frequently planned at the opposite end to the main entrance. Emergency exits will be referred to in the notes on the hall itself.

In larger schemes the main entrance will generally lead to the club rooms, classrooms, and other general rooms, with a separate main external approach to the hall, so that this may be used as an independent unit without disturbance to the remainder of the building. If a separate youth group is planned, this also may need a separate entrance. It is advantageous to plan a service entrance for delivery of fuel, removal of refuse and access to the kitchen, if this is large and provides continuous and considerable services.

Entrances should be planned generously in area, and should be related to the various groups of accommodation in such a way as to reduce cross-circulation and internal access corridors to a minimum. The main vertical circulation for buildings having two or more stories should be planned near the main entrance. Entrances should lead as directly as possible to general club rooms and to the lending library if one is provided. The warden's rooms should be near the entrance. Two sets of doors should be planned at the entrance, the outer set being normally open and the inner a pair of swing doors. The main doors should not be less than 4 ft 6 in. in the clear. Adequate mat-wells should be planned at all entrances. Efficient heating at entrances is of the utmost importance.

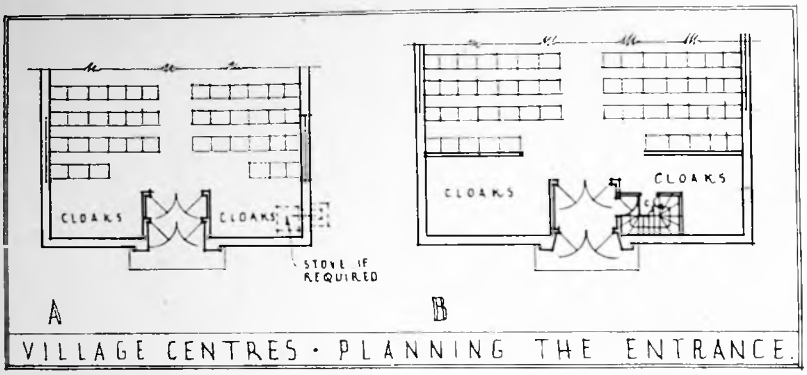


Figure 7

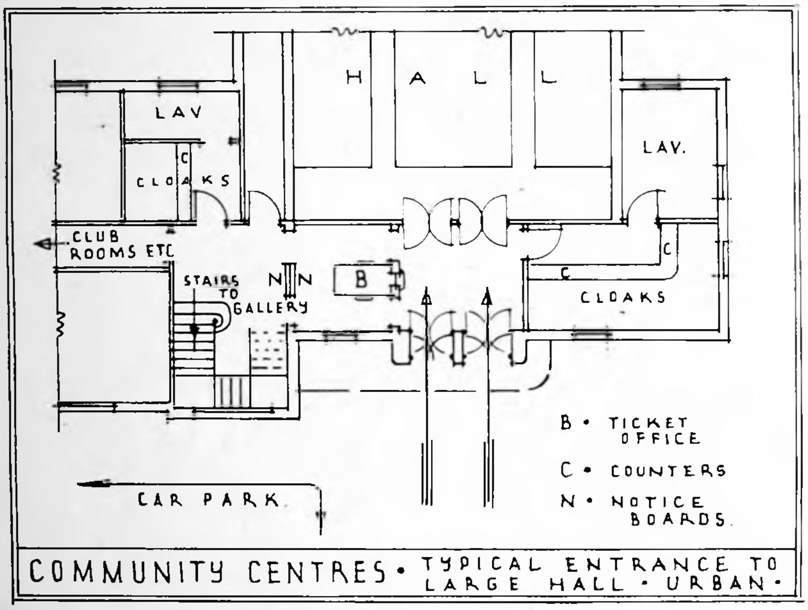


Figure 8

An ample notice board in a position easily visible to all entering the building and in a sufficient space for readers to stand clear of all main circulations is essential. The two sets of doors at the entrance not only reduce draughts and heat loss, but in small halls will often form a space for collecting tickets, money, etc.

Figure 7 illustrates two typical entrances to smaller halls. Type A is suitable for very small schemes, and Type B for small schemes with halls seating about 250 persons. Cloakrooms should be cut off from the halls ; thus forming a crush lobby within the entrance doors and may well have lavatory accommodation attached. The latter is desirable in all schemes, but its cost, together with extra drainage, frequently causes relegation to the stage and kitchen end of the hall only in small schemes. Type A of Figure 7 simply uses recesses at each side of the door lobby and has the objection that wet clothes are in fact stored in the hall itself. Type B not only more or less screens the cloak space from the hall or may even be curtained off, but also provides for access to a small projection room over the entrance ; cutting off the corners of the cloak space provides a little extra space at a position likely to be crowded.

Figure 8 illustrates a typical entrance to a large hall planned as a separate, though connected, unit of the community centre. In this example two doors lead past the ticket office in a crush space to the hall itself. The ticket office is placed so as to be in full view of all as they enter and also permits full supervision of the entrance doors ; it is advantageous if the ticket office is slightly set back so that those waiting at it do not interrupt the stream of people with tickets passing from the doors to the hall itself. The cloakrooms are very closely associated with this crush space and each has a lavatory leading directly from it. Adequate lengths of counter space should be provided in the cloakrooms to cater for many people during short periods. It should be noted that a corridor, cut off by a door, leads to the remainder of the community buildings. The staircase to the gallery can be reached after passing the ticket office without retracing one's steps, but it is also possible to reach the main doors from the same staircase by a more direct path on leaving. The outer entrance doors, which will be open during the times when the building is in use, fold back to permit free passage but the doors, which need to be closeable when the building is in use, are of the double-swing type. It is desirable to plan the openings or doors to cloakrooms and staircases in such a way that they are not hidden or involve turning back after entering the crush hall.

Figure 9 shows a general typical entrance to a large community building. Since the number of persons entering may at times be large, very generous space should be allowed for the hall space itself ; also it is very desirable to provide seating for visitors waiting in the entrance. In this example the cloakroom with its counter is planned on one side of the entrance doors immediately on entering the building, while the warden's office is placed opposite. Noticeboards are given very prominent positions where they may easily be seen by all who enter the building and ample space is provided around them so that normal traffic is not disturbed by readers standing at them. Lavatories for each sex are planned off the main entrance on either side of the hall space and just beyond the corridors leading to the main public rooms. The staircase leading to the upper floors is placed on the wall opposite the entrance doors and an adjoining central corridor leads to the craft rooms and the youth centre.

Cloakrooms and Sanitary Accommodation—Cloakrooms and sanitary accommodation for each sex should be provided independently for the community centre and for the main hall. Cloakrooms for the community buildings should be on a scale almost as generous as for secondary school buildings, based on the anticipated maximum population at any time, as it is better that outdoor clothing is normally left in cloakrooms rather than scattered in the individual rooms of the buildings. In very large community centres it may be desirable to have the cloakrooms under control, but normally open rooms will be found satisfactory. Cloakroom lay-outs are better if based on the use of coat-hangers, which may be placed at 4 in centres. Coathangers are less damaging to clothing than pegs, especially for women's clothing. The coat space occupied when hangers are used is approximately 2 ft and gangways should be not less than 4 ft wide if hangers are placed on both sides ; if, however, cloakrooms are controlled by attendants gangway spaces may be reduced to 2 ft 6 in.

Cloakroom areas, when these are attached to main halls, should be based on the number of persons who can use the floor space of the hall for dancing, as for almost all other uses of the hall the amount of clothing deposited in cloakrooms is likely to be much less. Cloakrooms attached to large halls

should be controlled by attendants and have long counters, so that many users can stand at them at the same time.

The amount of sanitary accommodation for community centres does not seem to have been prescribed, but a slightly more generous allowance than that given in the section on "Factory Buildings," should meet adequately the needs of the occupants; it is doubtful that allowances as large as those laid down for secondary schools are justifiable. The main hall should be provided with independent sanitary accommodation and this should be based on the requirements of the licensing authority, which are somewhat variable; general guidance to these requirements are given in the section on "Lavatories, Public and Communal."

The Hall—The size of the hall is entirely dependent on the population of the district to be served. If the community centre is planned in conjunction with a school, this is a unit which may be eliminated if arrangements can be made for a sufficient use of the school hall, although in fact such an arrangement may often have great disadvantages.

In small villages, with populations of up to 300 persons, a hall of 400 to 500 sq. ft. area divisible into two rooms will probably be adequate. In larger villages having up to 500 population seating for about 120 persons seems to be a fairly common requirement and can be provided in a hall about 45 ft by 20 ft, including the stage; this is, however, a very small building. If the population is between 500 and 1,500 a hall to seat 300 to 400 persons will usually be needed. It must, therefore, have an area of 1,500 to 2,000 sq. ft.

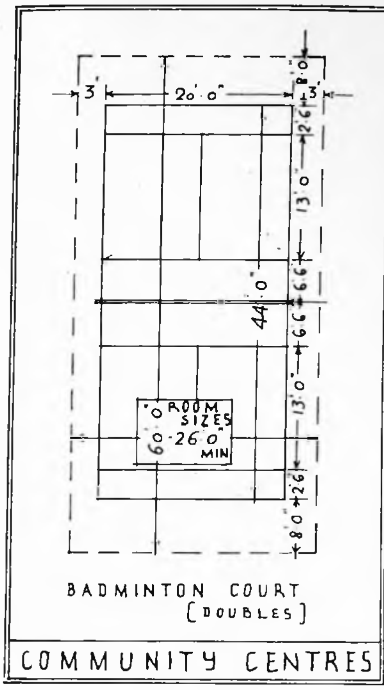


Figure 10

It should be noted that a badminton court, as shown in Figure 10, needs at least a space of 54 ft and is much better 60 ft long by 26 ft wide, exclusive of any area occupied by a stage; this area provides seating for about 300 persons. A hall to be used for badminton needs to be at least 11 ft high at the edges of the court and 15 ft 6 in at the centre; thus the roof springing should be at not less than 11 ft or, if flat, the ceiling must provide an overall height of 15 ft 6 in.

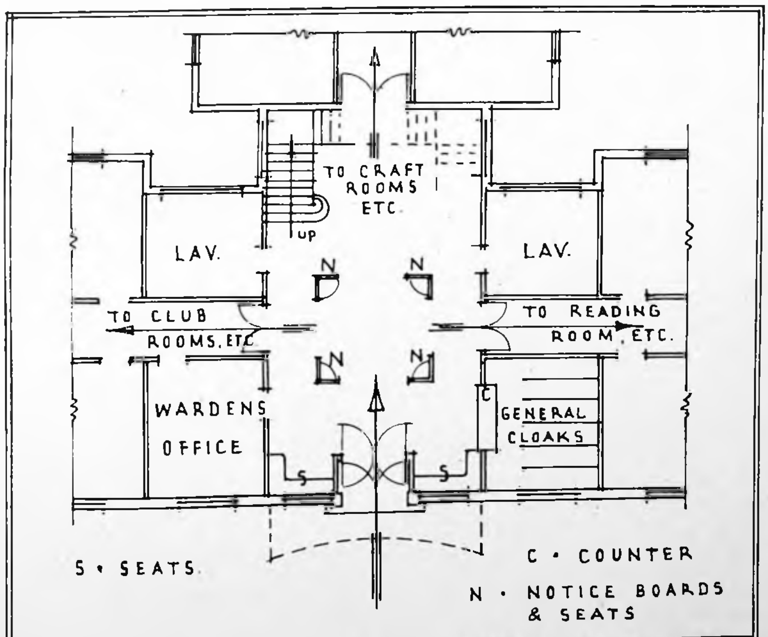


Figure 9

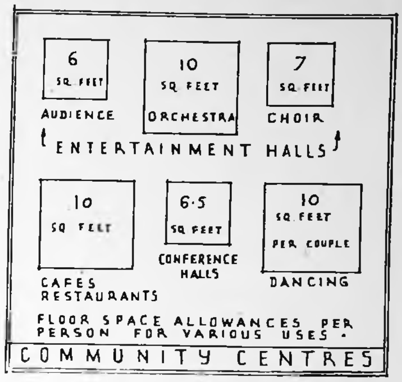


Figure 11

Where the population exceeds 2,000 the hall will probably need to be about 2,500 to 3,000 sq. ft. in area. In towns and neighbourhood units having populations of 3,000 and upwards, it may be desirable to provide two halls, one about 3,000 sq. ft. in area for large functions, together with a small hall of about 600 to 700 sq. ft. for more intimate uses such as lectures, debates and club meetings which need a room somewhat larger than a committee room but for which the main hall will be unnecessarily large and the stage probably unsuitable. Seating for halls should be based on an allowance of at least 5 sq. ft. per person, but this will be found in practice to be rather small after the deduction of gangways, and it will be found that an allowance of 6 sq. ft. per person is much more satisfactory for general purposes. Gangways should be at least 3 ft 6 in wide and more should be allowed for the main gangways in larger halls.

Figure 11 gives in diagrammatic form the space per person (except dancing, which is per couple) needed for various uses to which the stage and the floor of halls may be put; these approximate areas allow for normal gangways when they are needed as for dinners, seated audiences, etc.

Chairs are usually provided for seating, and consideration should be given to those of a strong nesting type and light in weight, as the hall may have to be cleared frequently if it is to be used for a wide variety of purposes. In halls with a large seating capacity and used for licensed purposes (music, dancing, etc.) provision will often have to be made to meet the demands of the licensing authority for the fixing together of the chairs in the rows and also, in some instances in very large halls, the fixing of at least the end chairs adjoining gangways; such requirements can be met without undue difficulty.

Halls should generally be rectangular and the length should be about twice the width, exclusive of the stage, but great length in proportion to width should be avoided for reasons of acoustics. It is usual to plan the main entrance at the end opposite to the stage or through a side wall close to the back wall, with the emergency exit or exits placed near the stage on

the side walls. Exits beyond or behind the stage are not readily accessible from the hall, as the stage generally takes up the whole or almost the whole width of the room, especially in smaller halls. All halls should have two exits and those holding more than 200 persons should have two exits each 4 ft wide in the clear, with doors opening outwards. In smaller halls a single central gangway provides the most economic and convenient lay-out for the uses to which such halls are put, but in larger halls more gangways are needed ; seats should not be more than seven from a gangway, thus limiting the number in a row to thirteen.

It is usual to provide a gangway at the front adjoining the stage of at least 4 ft width and a similar (or greater) space behind the last row to give circulation and waiting space, especially if the entrance vestibule is small, as is so often necessary for reasons of economy in small schemes. Much additional information applicable to halls of these types is given in the section on "Schools." The requirements of all larger halls, except specially large and well-equipped halls, are similar to the usual school hall, but for the exceptional cases other information may be found under Assembly Halls in the section on "Municipal Buildings."

In small halls the height need not be very great, and 8 ft 6 in to the springing of the roof is sufficient unless the room is to be used for badminton. Larger halls need proportionately higher ceilings related to the height needed for the stage and a minimum of 12 ft will usually be found desirable. It is, however, unwise to make the height greater than the width of any hall, or over about 28 ft. It is desirable that the greater part of the ceiling should be flat to assist acoustics, although for economy in small halls open types of roof have often to be adopted.

Figure 12 illustrates various typical sections of a number of small halls. Types A and B are the simplest, having an open roof pitched at about 8 ft 6 in above the floor and having collar beams as ties. The two pitches indicated are dependent mainly on the type of roof covering adopted. These sections can have a ceiling at the level of the collar beams, but with the flatter pitches the room might seem too low. Types C and D are similar to Types A and B, but the roofs are pitched from a greater height above the floor to obtain a ceiling at the height of the collars. Steep pitched roofs permit the introduction of high side-lighting by means of dormer or semi-dormer windows, leaving ample wall space and giving adequate and pleasant lighting to the room. Large areas of wall surface are useful for hanging pictures, for stalls which may be erected for "sales-of-work" and for gymnastic apparatus. If the hall is to be used as a gymnasium, strengthening of the roof may be needed to carry suspended equipment.

Type E shows another form of open roof in which the small portion at the apex may be ceiled in. For the use of a high pitched roof of this type a less amount of outside wall is needed, but it is probable that the acoustics will not be very satisfactory. Type F is also an open roof type without any ceiling which has the same objections as for Type E, but there is the advantage that the outside walls may be reduced to a minimum height.

Types G and H both have curved ceilings suspended from the trusses or timbering of high- or low-pitched roofs. The centres from which the curves of the ceilings are struck must be below the floor level, or, if the halls are very high, they may be placed well above head height to ensure good acoustic properties for the hall.

Type J is a fairly common one where a ceiling is required and from an acoustic point of view the faceted ceiling is satisfactory. If the roof is pitched at a reasonable height and is itself of a moderate slope, the shape is an economic one.

Typical long and cross-sections of larger halls are given in Figures 61 and 62 in the section on "Schools," particularly stressing the desirability

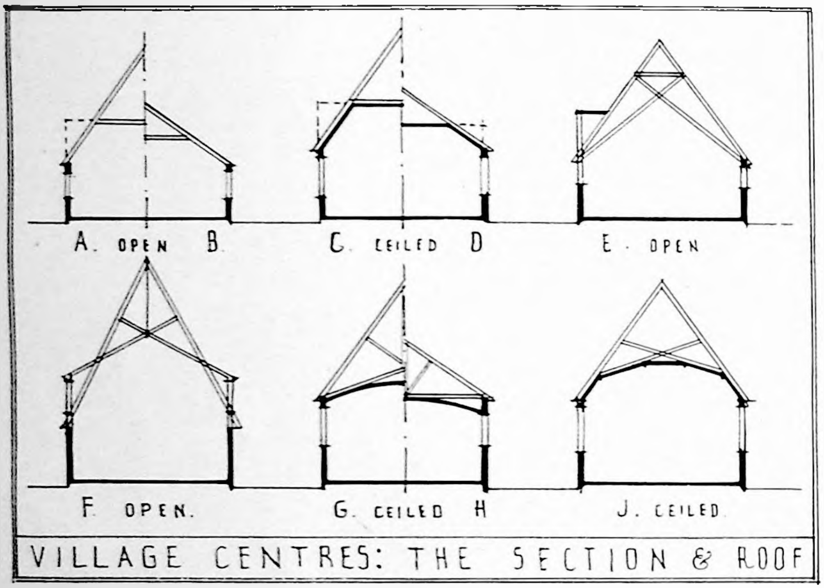


Figure 12

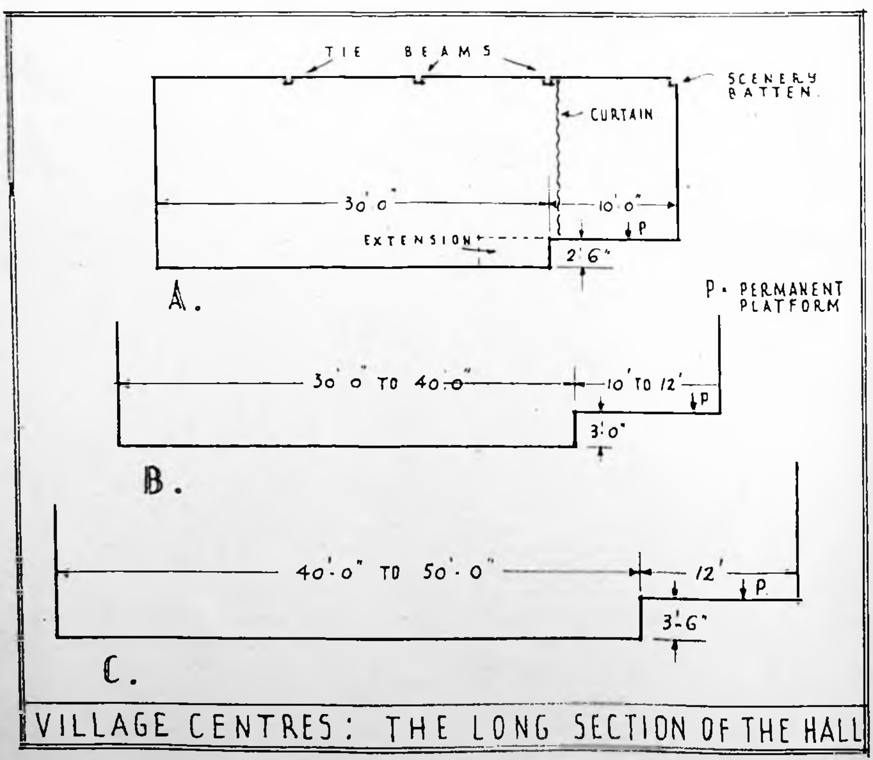


Figure 13

of flat or segmental types of ceiling, the latter having the centre of the radius placed well below the floor level of the hall.

Flat roofs are probably not very satisfactory for smaller types of hall, but may frequently be useful for the largest types of building. Apart from the question of suitability for the average village environment, and the possibility of ease of local construction (village craftsmen or small builders), it is doubtful if the use of flat roofs is economic on account of the average span required (upwards of 26 ft) and by reason of the extra height of ceiling necessary to obtain reasonable internal height. This last consideration especially arises if the hall is required for the use of a badminton club, or as a gymnasium. In the larger types of hall, however, in the more urban areas, these considerations are of much less importance.

Galleries—Galleries may be required in many large halls as a means of increasing the seating capacity in a given area of floor space. The essential factors affecting the design of galleries, especially the stepping of the seating to insure proper sight-lines from the seats to the platform, are given under Assembly Halls in the section on "Municipal Buildings"; in particular, reference should be made to Figure 21 that section.

Escape—Means of escape must be borne in mind in the planning of all doorways and staircases and more especially exit doorways; means of escape are controlled by the licensing authority and tend to vary a little between different areas, but general guiding information is given in the sections on "Schools" and "Municipal Buildings."

The Stage—A permanent stage is a necessity for almost every use to which halls may be put and, though it need not be a very large size, must be capable of extension to the full width of the hall. The stage should be level and not sloped, except possibly in very large halls to be used exclusively for theatrical purposes. The height of the stage above the floor must vary according to the length of the hall from the front of the stage, as shown in Figure 13. Halls up to 30 ft in length need the platform 2 ft 6 in above the general floor level. Those from 30 to 40 ft in length require the platform at least 3 ft above the floor and those greater than 40 ft in length not under 3 ft 6 in. in height; 4 ft is about the maximum height necessary, however long the hall may be. The projection of the permanent stage from the back wall should vary with the size of the hall itself, but in no case should it be less than 10 ft in order to accommodate with comfort several speakers and a table, while 12 ft is a more satisfactory depth; for larger halls, especially when halls are to be used for dramatic performances, at least 20 ft depth is desirable and preferably even more.

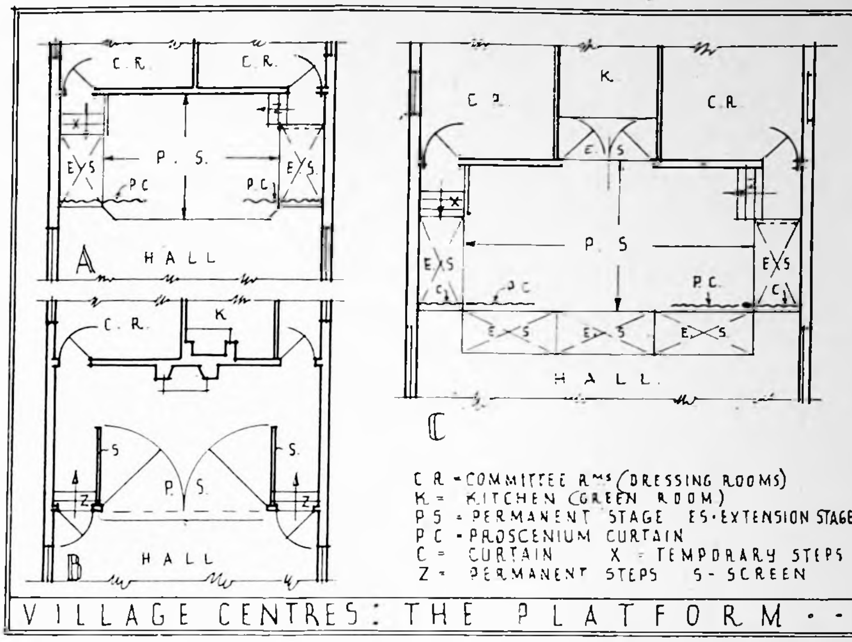


Figure 14

In small halls without a permanent proscenium it is wise to place a truss or tie-beam at the front of the stage from which to hang the front curtain; such an arrangement saves much work and trouble in fitting up temporary curtains and screens. In the larger halls a permanent proscenium should always be constructed. The proscenium opening should be at least 20 ft wide and should be more in wide and large halls; the height of the opening above the stage should be not less than 12 ft. At least 4 ft space is essential on each side of the stage for wing space. The permanent platform can often be so constructed as to form a useful storage space underneath it, where chairs may be placed when the hall is to be used for such purposes as dances. In small halls, however, it may be desirable to have the stage entirely removable, in which case it may be constructed of stout trestles or even tables of convenient size for moving in and out of the doors of the hall. Trestle types of table are not generally satisfactory, as they creak too badly and are frequently not strong enough for dancing or for dramatic performances. An extension or apron stage, formed of removable units having 3 or 4 ft projection from the normal stage front, is a very valuable addition, but this must be carefully borne in mind when planning the stage lighting, as this space cannot be covered from any light source placed behind the proscenium. In large halls, and elsewhere when possible, everything behind the stage front should be at the same level as the stage to avoid steps.

Access to the stage from the hall itself is needed for many functions; this may be made by planning for movable sets of steps placed either at the front or sides of the platform, according to the varied uses of the hall. A handrail is desirable to these steps, whether fixed or movable, unless enclosed on both sides, for the use of older and very young people. When access is to be provided from the hall to back-stage, pass doors should be planned near the outside walls and as far from the proscenium opening as possible. Steps to the stage level should be planned behind the proscenium front but, to avoid danger in the wings, it is wise to have a cover for these steps to form a level area. At stage level, the curtain should be near the edge of the permanent stage so that the fore-stage erected temporarily for theatrical performances does not project too far beyond the curtain. The curtain should not be placed at the front of the fore-stage, as it and the beam from which it is supported, or the proscenium, if any, may be disturbing elements acoustically.

Figure 14 illustrates a number of typical plans of stage arrangements for small halls. Type A is suitable for the smallest type of hall where there is only space for a small permanent stage with movable side additions for use during theatrical or similar performances. By the limitation of the width of the permanent stage and by the introduction of the side extensions when a full-width stage is needed, which is not very frequently, clear passage-ways at normal floor level may be provided between the hall and the back rooms; this obviates the necessity of going up and down two sets of stairs to reach the hall from the rooms behind the stage. Care must be taken to place flights of stairs sufficiently far away from the doorways to give adequate head room; alternatively, the heads of the doors should be raised above normal height. In Type A the steps to the permanent stage are in such a position

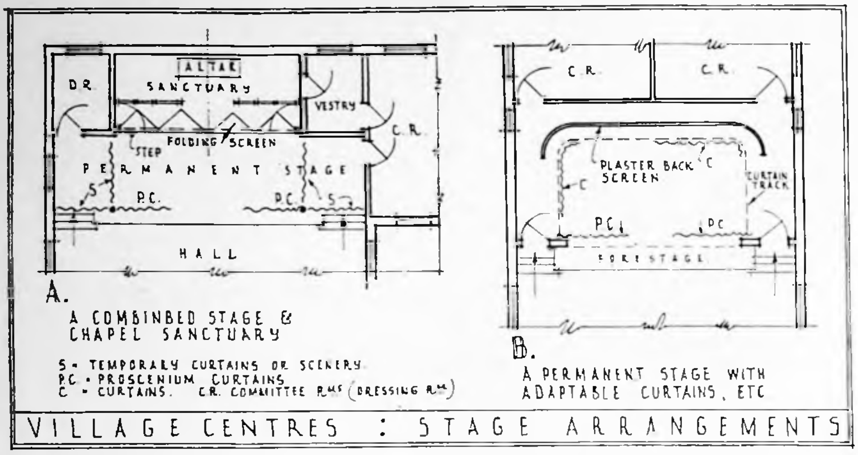


Figure 15

that they do not interrupt the side passage-ways and at the same time may easily be covered when a full stage is needed. Additional temporary steps may be placed at the front of the stage when specially required.

Type B shows another scheme for smaller halls in which the permanent stage occupies the full width of the hall. As there are no side passage-ways, the floors of the rooms behind the stage are all raised to stage level. In this example, the stage may be cut off from the hall for use as an extra room by means of two large doors which fill the proscenium opening. This is built as a permanent structure across the full width of the hall and has two small doors for access to the steps leading from the hall to the stage. The extra room thus formed by using the stage is very useful as a reading room or club room, especially when a fireplace is provided as indicated ; this fireplace may also be useful as a background for theatrical productions. Type C shows a larger hall with a permanent stage space to allow side passage-ways between the back rooms and the hall, and also indicates the placing of six equal-sized temporary additional units for enlarging the stage for theatrical performances. Three of these units form the apron stage, two fill the side passage-ways, leaving a space for the access steps to the stage and the remaining unit is placed behind a door in the centre of the back of the stage for use in connection with scenery storage or as a "vista stage." The curtain in this example is given a position at the front of the permanent stage and has an extension to fill the side passage-ways when required. Alternatively, a temporary proscenium may be used in its place. A temporary proscenium is much more satisfactory than curtains for such performances, as it is difficult with the latter to exclude the lighting of the stage from the audience. Opinions vary somewhat as to the provision of a permanent proscenium in small halls, as it is considered to be an inconvenience for many uses, particularly when access from the hall to the stage is necessary.

Figure 15 illustrates in Diagram A a scheme for small halls and village clubs in which the hall also has to serve as a church or chapel for occasional use. A small sanctuary is placed behind the permanent stage and divided from it by a folding screen. The sanctuary must have sufficient depth for the altar itself, room for the priest between it and the altar rail and space for the folding screen to move. The sanctuary is raised one step above normal level of the stage, which has permanent access steps on each side, the projection of which forms the apron stage. A small room, serving as a vestry, is provided with direct access to the sanctuary behind the folding screen and is entirely cut off from the stage.

Diagram B of Figure 15 shows a more elaborate stage which generally involves more cost with more elaborate stage lighting. A permanent proscenium divides the hall from the stage, in front of which is an apron stage, flanked by steps and doorways giving access to stage level. On the stage is placed a plaster-faced background or cyclorama for stage settings and to assist acoustics ; it can also serve as a screen for cinematograph or lantern productions. Between this background and the front curtain are arranged two curtains on suspended tracks which may be moved to form side or back screens, leaving central or side entrances. This provides a very adaptable background serving all purposes for which a small stage may be required. In such a scheme with permanent curtains, windows on the side walls of the stage should be kept small and in such positions that they will be screened from the audience ; efficient means of darkening these windows are essential. Walls at the back of any types of stage suggested may advantageously be finished in hard white plaster to serve as a screen for lantern or cinematograph purposes.

Figure 16 illustrates an example of a large stage suitable for the main hall of a community centre or neighbourhood unit. When a very large and fully equipped stage has to be planned additional accommodation to that already mentioned becomes necessary such as rooms to serve as carpenters, and electricians' shops, under-stage space and sufficient height over the stage for the grid and for flying scenery supported from it. Full fire precautions must be installed ; these must usually include a fire curtain and fire-resisting walls must be provided to separate stage from auditorium ; roof-lights having automatic opening side-lights operated by means of fusible links and thoroughly adequate escape facilities for all users of the stage part of the "house." The general equipment for the handling of scenery must be more elaborate, as also must be the lighting installation, including facilities for flood-lighting the stage from the auditorium.

Figure 16 gives general information about the larger type of stages ; it is in diagrammatic form and is based on a typical installation ; since, however, stages must vary so much according to the circumstances of each building precise sizes cannot be given ; the height of the grid above the proscenium opening must be rather more than the opening itself, and at least 6 ft is needed above the grid as handling space.

It is desirable to have a property store on one side of and adjoining the stage and also a scenery dock, the latter having direct access to the street, with doors of sufficient height and width through which to move large pieces of scenery. The equipment shown includes floor traps, a cyclorama and a fore-stage. It will be noted that the stage itself is cut off from the remainder of the back-stage accommodation by a corridor from which the dressing rooms are reached ; this corridor should be wide enough for performers to use as a waiting space, or additional space should be planned in the form of a green-room.

In community centres for large towns or important areas it may be necessary to provide these large halls with special stage equipment for concerts and choral singing. Also, in these large halls where elaborate stages are provided it is usual to make provision for an orchestra in a correctly-designed orchestra pit in front of the stage itself ; such an orchestra pit should be sunk sufficiently below stage level and often below the floor of the auditorium, to ensure that neither the heads nor the instruments of the players project above the sight-lines from the front row of seats to the floor of the stage or any permanent footlight installation. It is desirable, therefore, that there should be at least 7 ft from the stage level to the floor of the orchestra pit. The pit itself should be at least 7 ft 6 in wide and should extend at least for the full width of the proscenium opening, if not the full width of the hall. Part of the pit is sometimes recessed under the front of the stage ; in here the clear height must be adequate for seated players and certainly not less than 6 ft. Frequently the front of the orchestra pit is constructed as a load-bearing wall so that an extension to the

stage may be carried on this wall for use when the pit is not required, as for example when the stage is used for a concert. For the accommodation of an orchestra and chorus on the stage it may be necessary to provide removable additions to form stepped tiers ; such additions should be formed of units of sizes which are not unduly difficult to handle with the minimum of labour, but at the same time they must provide at each level sufficient space (particularly width) to seat performers without discomfort to adjoining performers, especially instrumentalists.

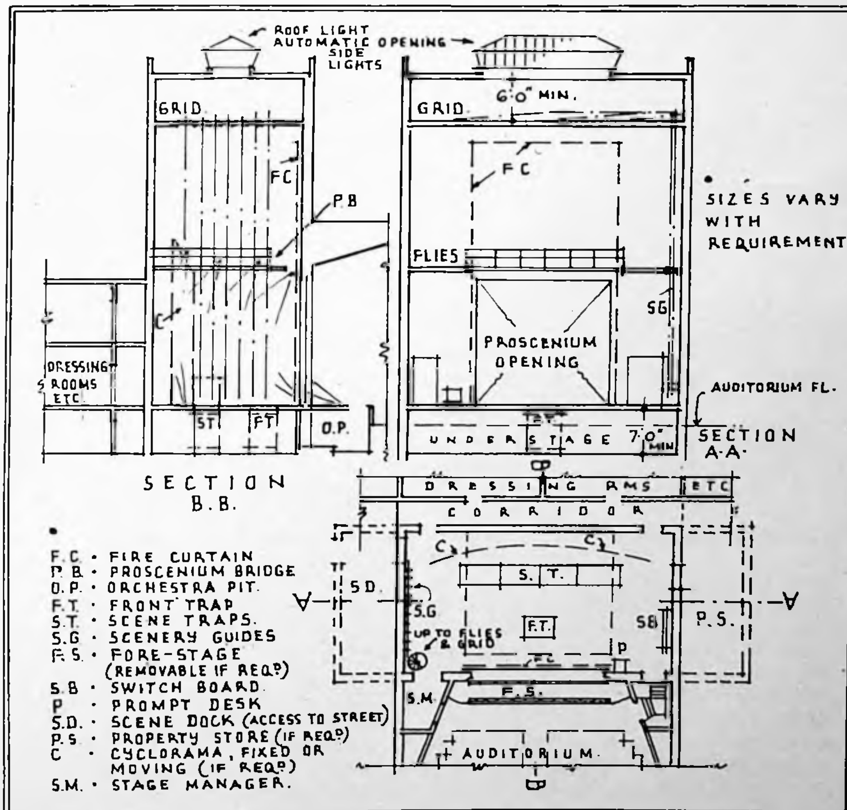
Stage Lighting—It may be assumed that electric power is likely to be available in the future for almost all halls, both large and small, and consequently stage and hall lighting problems are greatly simplified. In small halls elaborate equipment is not necessary but for large halls, in many instances, fairly comprehensive lighting facilities may be needed. In smaller halls provision should be made for at least 20 amperes with a master-switch capable of the full load ; a small switch-board, from which all lights, including those of the hall, may be controlled should be planned on the stage. Larger halls should be provided with 30 to 40 amperes and very large types, except those with specially elaborate equipment, with at least 50 amperes. Wiring should allow for three or four separate colours in footlights and battens and also for flood- and spot-lights. Care must be taken to provide lighting from the auditorium to light adequately performers standing on the apron stage or very near the footlights and this is usually met by the installation of flood-lights on the side or back walls of the hall. Even in small halls with simple equipment the lighting battens should be removable or be capable of being lifted to the ceiling and footlights should be removable as they are a nuisance except for theatrical performances. Ordinary lighting units should be installed to light the stage when used for meetings and purposes other than theatrical uses. There are a number of books published on the subject of stage lighting, especially from the point of view of smaller halls requiring less elaborate equipment, in which are detailed more precise requirements than it is possible to include under the heading of planning. Large schemes may, in any event, need the advice of a specialist consultant.

Hall Lighting—Good daylight is most important, as the halls in community centres may be used quite considerably in daytime as well as at night. Lighting for both day and night should be designed to make the room pleasantly and evenly lighted. It is important that easy control of artificial lighting is provided both from the stage and from any projection room that may be installed. The amount of artificial lighting should be such as will provide about 6 f.c. at 2 ft 9 in above the floor, which is sufficient to be able to read fairly comfortably and to light adequately exhibits or stalls placed in the hall from time to time. Facilities for darkening the room in daytime should always be installed, as any additions for this purpose after completion of the building are often unsightly and unsatisfactory. Similarly, if electricity is not available at the time of building, provision should be made to avoid surface and similar systems having to be installed at some later date. Care should be taken to use fittings which will not obstruct the beam from a projector at the back of the hall and special thought must be given to the placing and design of the fittings if the hall is to be used for purposes such as badminton or gymnastics.

In all schemes provision must be made for an emergency lighting system by some means alternative to the main lighting source.

Gramophones and Amplifiers—It is advantageous to equip all halls for the reception of wireless programmes, music amplification and for the playing and amplification of gramophone records. In very small halls a normal type of radiogram may be adequate, but for all larger halls an equipment designed for the purpose with built-in wiring from a control room to built-in amplifiers ; such equipment needs a permanent position in which controls, turn-table, etc., may be enclosed and locked. Record storage should be incorporated. The amplifiers should be placed in the ceiling and made as inconspicuous as possible, but easy access should be given to all parts of the installation without undue difficulty. The main control equipment is best placed in one of the wings of the stage, or alternatively with the sound equipment in the projection room if one is planned.

Cinematograph—Frequently, it is desired to show cinematograph films in halls both large and small and, whenever practicable, correct and proper permanent provision should be made for the exhibition of films. The 16mm non-inflammable types of film may be used with a portable projector standing temporarily in the hall, but for inflammable and all sizes larger than 16mm film a fire-resisting enclosure must be used, although for very occasional use in smaller halls this may be a temporary enclosure. It is, however, wiser with the increasing use of films to plan a proper projection room, which can usually be arranged over the entrance and cloakrooms. A projection room of whatever size must have fire-resisting walls and ceiling and be accessible without entering the main hall. Doors must open outwards and be self-closing and very good ventilation is essential. The dimensions necessary for a projection room are at least 6 ft 6 in by 5 ft for one projector and if there is sound equipment this area must be increased ;



COMMUNITY CENTRES : ESSENTIAL PARTS OF A LARGE STAGE

Figure 16

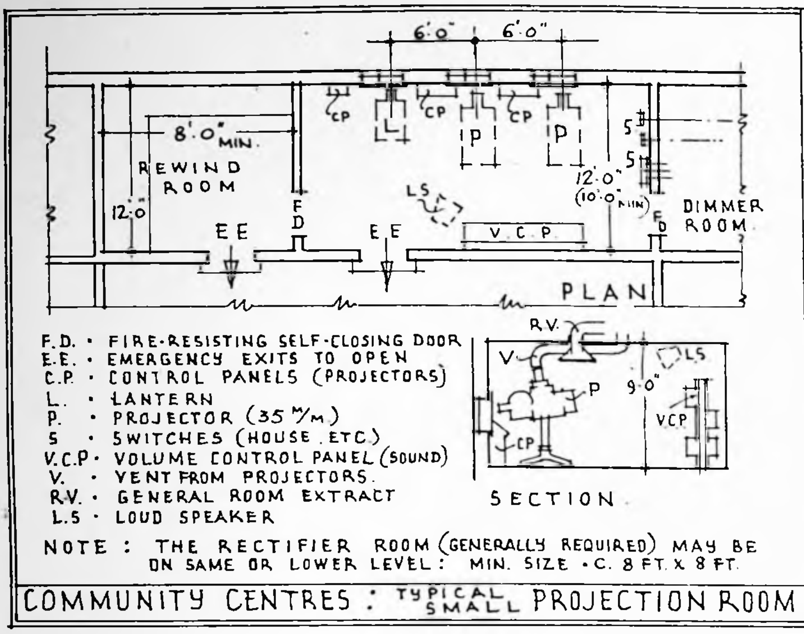


Figure 17

the room must be at least 7 ft high. A separate room adjoining is usually planned for re-winding and this needs a floor space of at least 6 ft by 6 ft. For larger and permanent installations to be used frequently more elaborate planning is essential and two projectors are usually provided. Figure 17 shows the more important features of a typical projection installation for a larger hall. In many schemes it is usual to provide also a lantern for the projection of still pictures, notices, etc. For such an installation the projection room must be at least 10 ft wide from the wall of the auditorium, but with full sound equipment it is better to allow 12 ft. Projectors should be at least 6 ft apart centre to centre to provide space for control panels and the operator ; thus with the installation shown, including sound equipment a floor area of 12 ft by 24 ft is desirable, to which should be added a re-winding and film-storage room 8 ft long and of the same width. Space is often needed adjoining the projection room for dimmers for the auditorium lighting, and also space at least 8 ft by 8 ft for rectifiers, although the latter may be on another floor. Both the projector and re-winding rooms must have separate access for escape purposes and the two must be separated by fire-resisting doors. The projection and observation apertures between the projection room and the auditorium must have fire-resisting self-closing shutters which also can be released manually. Ventilation is of great importance both for the room in general and for the actual projectors ; considerable heat is generated and should be removed quickly to provide reasonable working conditions for the operator.

The projectors should be planned as nearly central as possible on the axis of the hall and with as little rise or fall in the projection lines as possible. Projection rooms with major equipment should be at least 8 ft and preferably 9 ft high to permit the ventilation installation being placed where it will not cause obstruction. Projection rooms are frequently lined with sound-absorbent materials to reduce the noise of the machines to a minimum.

Where films are to be shown regularly a county council licence is needed, and this may necessitate the fixing together of chairs in rows, each having not less than four nor more than ten chairs. Many of the films now available even in the 16mm size have sound attached, and therefore it is desirable to provide in all halls for the necessary wiring and amplifiers when the hall is built. Controls for the lighting of the hall other than emergency lighting should be placed in the projection room.

Heating and Ventilation—Some form of heating is essential in all schemes, regardless of size. For very small schemes the halls may be heated with one or more slow-combustion stoves and additional rooms with similar stoves or open fires ; for all larger schemes a more general heating system should be installed. Many types of stove if placed in rooms are inclined to be dirty, rather difficult to control and are drying to the atmosphere as their surfaces tend to become very hot. Various forms of air-heaters have been installed and proved efficient, but for larger schemes a low-pressure hot water system of some kind becomes essential. When a heating system is installed, all the rooms of the building are heated from one boiler, with a consequent saving in labour and fuel costs. A number of schemes having club or common rooms supplement the central heating system with local units such as open fires or openable stoves, mainly, it would seem, for reasons of appearance.

Stove or radiators should, where possible, be set in recesses in walls. In very small schemes where rooms are used intermittently, it may be found that gas or electric radiators, panels or tubular heaters are more economic than a general hot-water system, although it is necessary to maintain some low-temperature heat fairly continuously in order to keep the building and its contents dry and in good condition, with easy control to increase the temperature when the building is in use.

Artificial ventilation is seldom installed, except in larger halls, when mechanical extract fans or a full air-conditioning system may be desirable ; windows therefore, should be designed to have ample opening portions, especially near the ceiling, and should be placed so as to give good cross-ventilation. If halls have open types of roof, additional ventilation may be obtained through the gable ends or high-level dormers.

Storage—Provision has to be made for the storage of chairs, etc., in almost all halls when the latter are cleared for such purposes as dances, but it is also often necessary to store tables, stalls and similar equipment used in the hall from time to time, together with theatrical scenery and properties. Chairs, tables, and similar equipment must be stored in a position easily accessible to the floor of the hall, while scenery and the like must be in close relation to the stage. As already mentioned, chair-storage space can often be provided under the stage and made accessible through the stage front (see Figure 61 of " Schools "). Larger halls used frequently for theatrical performances should have a room set aside for storage of properties, curtain battens and other stage equipment in positions easily accessible to the stage itself and also from the exterior of the building for the delivery of hired scenery and properties ; this room should generally be at stage level. Wardrobe storage and work-rooms are also sometimes needed in larger centres.

Halls used for gymnastic purposes should have a suitable storeroom, opening directly off the hall, preferably at the end away from the stage to provide for all the removable apparatus ; this room should have an area similar to that recommended in connection with school gymnasia.

When small halls are to be used by a number of clubs or societies, especially if there are few other committees or club rooms, a series of lock-up cupboards may be needed and should be planned so that they do not obstruct the full use of the room for normal purposes.

Green Room—It is most desirable to have a large room or open floor area behind the stage in which performers may assemble before moving on to the stage, as by this means the wings are

kept clear of waiting artists, thus facilitating the handling of scenery and properties. The green room should be on the same level as the stage. Daylight is not necessary and, in fact, may be an inconvenience. It is quite usual to plan this room as an open space from which the dressing-room accommodation is approached, but the possibility of using it for rehearsals or readings should be borne in mind.

Dressing-Rooms—Reference has already been made to the planning and use of rooms behind the stage for dressing-room purposes. The numbers and size of these rooms vary according to the size of the scheme and the amount and extent of the theatrical performances anticipated. At least two rooms are required, although it may be possible to use one large room divided by a folding screen or partition in small hall schemes. In the larger schemes the minimum number of dressing-rooms is one small and one large room for each sex, but it is advantageous to have a number of small rooms for the use of the principle artists in addition to the large rooms which are used by the remainder of the performers. Lavatory basins should be installed, either in or adjoining all dressing-rooms and W.C.s, for each sex must be planned in close proximity. Dressing-rooms should be generously equipped with well-lighted mirrors and when the rooms are used solely as dressing-rooms, fixed continuous make-up tables about 18 in high should be installed below the mirrors.

Billiards Rooms—Many village halls, clubs and community centres require facilities for billiards. In small schemes the cost usually prohibits the provision of more than one table. The full-size table is 6 ft 8 in wide and 12 ft 8 in long, and requires a room with a floor area, for proper cueing-space, of not less than 18 ft by 25 ft, to which should be added space for seats or benches for spectators, which needs an additional width of 18 in at least and preferably rather more. It is advantageous for club purposes to provide a raised platform for seats on one or more sides of the room in positions in which onlookers least disturb the players. A close connection to the refreshment room is desirable and, if more space can be allowed, some easy chairs and tables should be placed in the room, as it is likely to be one of the most frequented rooms in the men's club-section of a community centre.

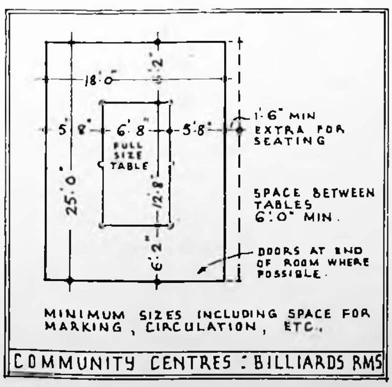


Figure 18

In large schemes where more than one table is planned, it is desirable that the space between tables is not less than 6 ft, although sometimes this figure is reduced to as little as 5 ft.

Lighting for both day and night use must be given proper consideration, especially the latter, when the table is most likely to be used. A considerable area of wall-space is needed for cue racks and for a marking-board. The essential information as to the lay-out of a billiards room is given in Figure 18; it should be specially noted that care is needed in the placing of doors, so that when they are opened undue obstruction of the play area does not occur; doors should be planned to be between the tables and in the wall nearest the ends of the tables. Good ventilation should also be provided by the careful planning of windows to ensure good cross-ventilation, especially at high level.

Club, Committee and Common Rooms—As already mentioned in the paragraphs on the hall, one or more rooms may serve jointly as dressing-rooms or club or committee rooms in small schemes, but in larger schemes, separate rooms should be allocated for these uses. Also in large schemes, if conditions permit, separate rooms should be planned for the use of younger people, preferably in positions where noise will not be unduly disturbing to the use of adjoining rooms. Common rooms will need to vary in size with the population of the district served by the centre; large centres will need at least one room of 800 to 1,000 sq. ft., and in smaller centres a room of 500 to 600 sq. ft. may well suffice. The kitchen and canteen should be planned in close association with the common room. General purpose rooms should be of varying sizes in each scheme in order to provide suitable accommodation for different-sized organisations, however large or small. Rooms may be designed with some advantage on a unit basis, as shown in Figure 19; this permits of regular fenestration and straightforward elevational treatment, and leaves the internal partitions readily alterable if need arises in the future. Rooms should not be more than 18 to 20 ft in depth for economical planning; in fact, greater depths should be avoided as lighting from the windows, especially where the latter are on one side only, may become insufficient. A good working grid-unit seems to be from 11 to 13 ft by 18 to 20 ft in depth. Figure 19 is based on a unit of 12 ft and shows that, by the careful planning of partitions, both fixed and movable, rooms of several sizes are made available. A room extending for three 12 ft bays can be used either as a fair-sized club or common room or as two committee rooms, one for a small organisation and the other for a large meeting.

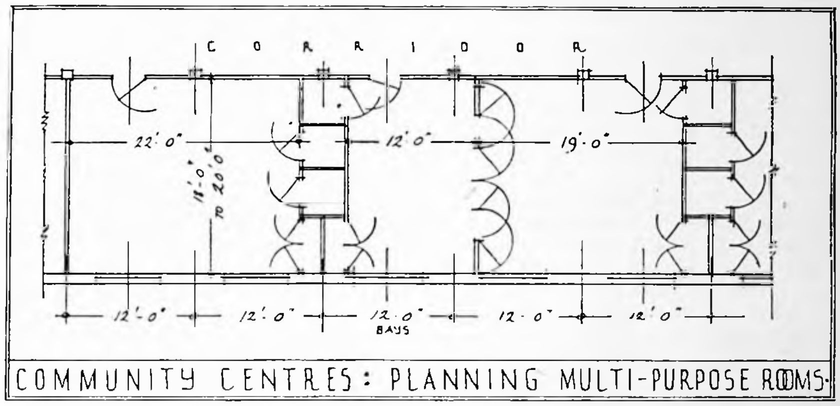


Figure 19

Lockers or cupboards are often wanted for committee or club rooms where each body using the rooms may lock up its own property. The space-needs of these cupboards vary considerably; some are required to store a few books, whereas others have to house a fairly considerable quantity of apparatus. Fittings on a standardised unit basis should be built into the building for this purpose whenever possible. Such a course makes for economy and is tidier and cleaner than the provision of loose furniture. Suitable units for such fitments may easily be settled with the promoters and can become constant throughout the building, whether in the initial scheme or in the ultimate extensions.

Rooms to be used as classrooms and similar purposes may well be based on the same units as those adopted for club and committee rooms, and their planning and general arrangement should conform to the usual requirements of school buildings; these are discussed in detail in the section on "Schools." Aspect for these rooms, either as class, club or committee rooms, is not of such great importance as in normal day schools, in view of the fact that they will chiefly be used during late afternoons, in the evenings and more especially during winter months. Some of the main club and common

rooms may, however, be in constant use throughout the year; then full consideration should be given to the most suitable aspects and, where possible, suitable prospects. In addition, easy access to gardens or terraces assists attractiveness. Where club rooms are used regularly by old people, pleasant and quiet aspect becomes doubly important.

One of the minor problems attached to club rooms is involved in the furniture. This has often to be varied for each successive use of the rooms; it is wise, therefore, to incorporate in the general plan some suitable storage places of such sizes as may be adequate for spare and alternative furniture to be kept near to the various rooms to avoid excessive handling. Much of this re-arrangement of rooms and their contents for different purposes is carried out by members of the individual groups using the rooms and much damage may be done both to furniture and building by carelessness brought about by bad planning at the outset of the scheme.

Games Rooms—These should generally be similar to club and common rooms and have areas of at least 800 sq. ft. except in smaller schemes, where the sizes may be reduced to 600 sq. ft. Good lighting, particularly for evening use, is most essential. The uses to which these rooms may be put vary from quiet games such as chess or cards to noisy and energetic ones such as table tennis. Figure 20 shows the essential spacing required for various games. (See also section: "Public Houses.")

Class Rooms—The planning requirements of rooms which may be or are definitely to be used as classrooms follow the normal requirements for schools; care, however, should be taken to isolate classes as much as possible from noise which may occur in club rooms, games rooms, the gymnasium or assembly hall; it must always be visualised that many or most parts of the building may be in use at the same time. The necessity for providing classrooms is largely dependent on the extent and proximity of suitable schools or county colleges and, especially, technical schools. There are, however, certain subjects or classes which naturally may be grouped better with the activities of a community centre than with more formal school organisations. If adjoining or neighbouring schools are to be used, only those which are suitably equipped for adult pupils are of value. Normal secondary school furniture, except possibly that provided for very senior pupils, is too uncomfortable for the use of older persons. Classroom sizes and equipment are given in the section on "Schools" but slight increases in area to accommodate larger sizes of furniture and equipment would be advantageous. It may be assumed that the maximum class size would be 30 pupils. Classrooms for special subjects may have to be equipped for multi-purpose uses, with consequent increases in floor areas to accommodate extra equipment or special apparatus. Craft rooms for heavier types of work should be at least 1,000 sq. ft. and "light" craft rooms should not be less than 750 sq. ft., plus space for fixed equipment for certain subjects such as cookery demonstrations. A large type of community centre is likely to require special rooms for various kinds of handicrafts and manual work, and also for domestic science. A studio for art work may be needed and this should be given a north or north-east aspect, as it may be in use during the daytime; for similar reasons, handicraft and cookery classrooms should have correct aspects as suggested for these rooms in the section on "Schools." Rooms planned for these special purposes, as a general rule, cannot be used for other subjects, since much of the furniture and equipment is fixed or, even if movable, may be too heavy or bulky to be easily moved or stored. Ample storage space should be attached to the craft rooms in which to keep materials, part-finished work and spare equipment. Provision may also be needed for individual lockers (for which a small rental charge is sometimes made) for the storage of clothing, books and other personal property between attendances.

Reading Rooms—The amount of accommodation for reading, library and news-room purposes is likely to be very different from scheme to scheme. Generally, however, it is probable that one room may have to serve the combined uses. The room may be a small one in which members may read current periodicals and possibly have facilities for writing, or it may be quite a large library with wall shelving and library reading tables, etc., occupying two or more rooms. The alternative, which may be a welcome asset to the community centre, is a branch of the town or county library planned to form part of the whole scheme. If such a library is contemplated, it should be based on the normal open-access library lay-out, with a librarian in charge at fixed hours to control the changing of books. If the librarian can only attend on certain days of the week or for a few hours daily, it may be advisable to have a separate reading room which is always available, or the bookcases must be fitted with doors and be locked if the same room is to serve both as the library and reading room. Full information concerning the planning, equipment and furnishing of libraries and reading rooms is given in the section on "Libraries." In general the appearance and decoration of library or reading rooms should be homely or have a club atmosphere rather than that of an institutional character. The furniture, as in public libraries, must be strong and well-made to withstand hard usage, but could well be more comfortable than that generally provided in public libraries. Quietness and pleasant aspect are also essential factors in placing this unit within the whole scheme.

Gymnasium—If a gymnasium is provided it may also be used as a room for indoor games such as badminton, deck tennis, table tennis, fencing and boxing. It is desirable that the gymnasium is so sited that direct access is available and, if possible, adjacent to an open-air space suitable for exercises and training, and in fact one wall might, with advantage, be designed as a series of large glazed openings. Generally, the design and lay-out of gymnasia in community centres should follow those recommended for secondary schools in the section on "Schools" except that the wall bars may need to be moved or limited to one side, if openings are provided on one long wall. Also, the changing rooms and shower baths may need a little different treatment to give increased privacy, especially for those used by women.

School gymnasia now have to be 70 ft by 40 ft and it may be assumed

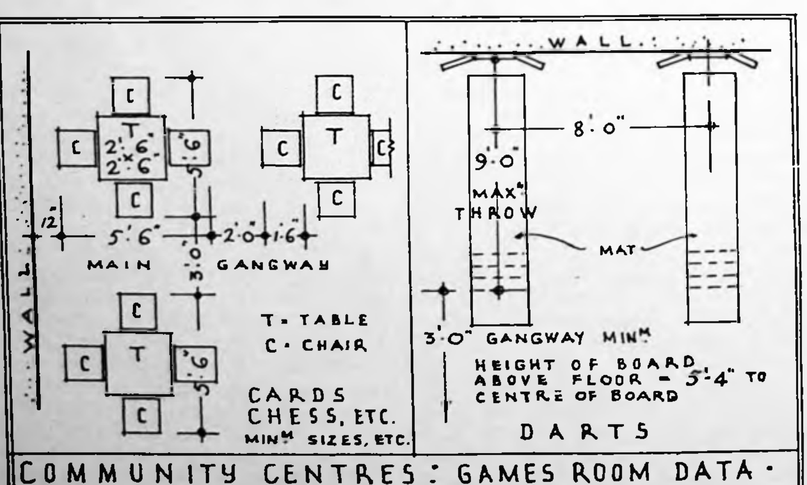


Figure 20

that this will become the generally recognised size and, therefore, applicable to other types of building. In no case should the gymnasium be less than 50 ft by 25 ft. Gymnasia with large areas are specially advantageous for this type of building, where classes may comprise adults and may be large in numbers.

The changing rooms may be used exclusively for the gymnasium, but they may also be needed in connection with outdoor sports if playing fields adjoin the community centre. Separate changing rooms with bathrooms and/or showers should be provided for each sex; in addition it may be desirable to provide lockers either in the changing rooms or in a separate locker room, where clothing may be left from week to week to save transport to the building for each visit. Small ventilated lockers about 12 in by 9 in and 12 or 15 in deep of metal are adequate for the majority of users, unless players of games such as badminton wish to leave rackets as well as clothing, when the lockers must have one dimension at least 2 ft 6 in. in the clear. Tiers of lockers should not be more than 6 ft 6 in above the floor level. Dressing cubicles are generally provided for women but are not usual for men. One or more tub baths are desirable in addition to shower baths, especially for women. The equipment of an ordinary open changing room should consist of fixed wooden topped seats and clothes pegs or hangers; the size of the changing rooms are dependent on the maximum number of persons who can use the gymnasium at any one time and should be based on an allowance of 8 or 9 sq. ft. per person, with the area of the baths in addition. One shower-bath should be allowed for every eight persons.

Table-tennis tables vary very much in size from as little as 5 ft 6 in by 3 ft to 9 ft by 5 ft. Tables should be at least 15 ft apart end to end for normal play, but for special club games or matches much more space should be allowed. The space between tables should not be less than 6 ft for normal play. As already stated, badminton requires an area of at least 54 ft by 25 ft and therefore a gymnasium of less than 60 ft by 30 ft is of little value for this purpose (see Figure 10).

Boxing, as illustrated in Figure 21, requires a "ring" of varying sizes. The "ring" under Marquis of Queensbury rules is 24 ft square and under National Sporting Club rules varies from 14 ft to 20 ft square. It is an advantage to have a raised platform for the ring, but for normal practice purposes and general gymnasium training when there is no audience the supports may be fixed into the normal floor of the room. The "ring" for normal practice may well be placed at one end or in a corner of the gymnasium, or alternatively, in a gallery over the changing rooms at one end of the gymnasium; for the occasional match or display the "ring" should be in the centre of the room, preferably on a raised platform and temporary seating arranged round it. The seating should not be placed less than 5 ft from the ropes to allow circulation space for the boxers, seconds and timekeepers.

An apparatus storeroom directly approached from the gymnasium is essential and it is advantageous to provide a small room for the use of the instructor.

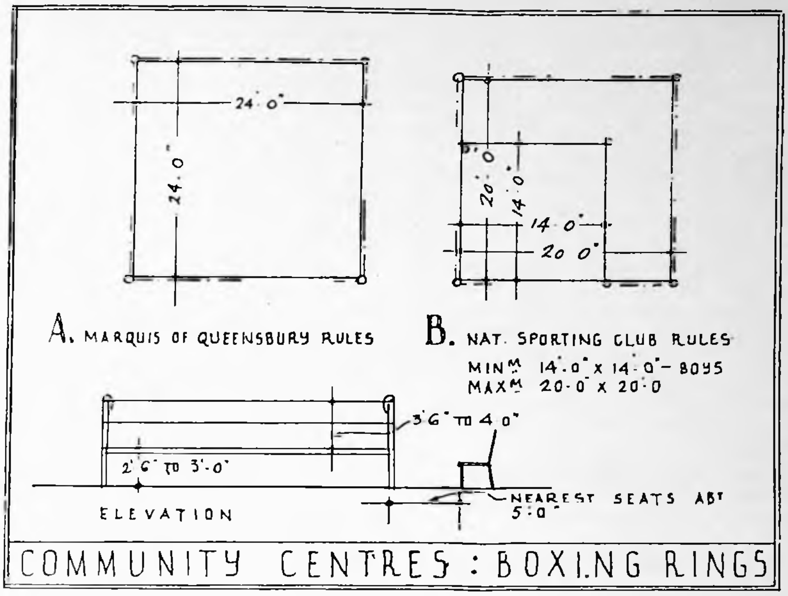


Figure 21

Refreshment Service—This service may vary with providing the occasional tea and cakes to regular full meals and may even be planned as part of a school-meal scheme. The Ministry of Education Report on Community Centres stresses the importance of providing good canteen facilities as a means of assisting conditions at the centres and as a factor in the social education of members. A good canteen should also be a profitable addition to the income of centres.

The service of alcohol is rather a controversial matter; views may be obtained that are both favourable and strongly opposed. If alcohol is served a club licence will be required which will necessitate the control of bars and storage in non-licensed hours to comply with the requirements of local licensing authorities.

In small halls and village clubs, it is possible that the refreshment service will be confined to light refreshments such as soft drinks, tea and coffee and as far as food is concerned, bread and butter, sandwiches and cakes. Every hall, however, regardless of size, requires a kitchen for the preparation of meals of some kind. This accommodation may be arranged in two ways; firstly, as a very small room in which a cooker and sink are placed and which is used only for actual cookery work, and to which another room must be attached in which all other preparations such as cutting bread and butter, laying trays, etc., can be done; such an arrangement allows for a fairly large space to be available for other uses when cooking is not needed by the closing-off of the small kitchen. The second lay-out which is more generally approved is to take one fairly large room in which a cooker and sink are placed and all associated tasks are performed. The reason giving preference to this scheme is that the kitchen frequently has to cater for large numbers; also that it will provide room for small cookery demonstrations in connection with Girl Guide and Women's Institute activities.

Figure 22 illustrates two typical kitchens for the smaller type of centre; the equipment needed is a large cooker, sink, table and ample storage cupboards for china and glass. Frequently a copper is also fitted for the provision of large quantities of boiling water required within short periods. In Type A the kitchen is separated from the committee room by a folding partition which permits the two rooms to be used together for demonstrations. Type B, with two rooms in addition to the kitchen, allows one free room for committees, etc., while one is being used in connection with the kitchen for service to the hall itself; also, it allows two separate organisations to be served with refreshments at the same time.

In larger community centres the amount of space needed can usually be provided in one room, with the possible addition of storage space and, in some schemes, with the addition of a pantry or servery. Where, however, a really full-meal service is to be provided or the unit forms part of a school-meal service, the kitchen should be developed on the lines recommended in the section on "Schools." The area of the kitchen is entirely dependent on the probable number of persons to be served at one time and the nature of

the meals served ; it should be remembered in connection with large functions that may take place in the hall that the service will often be wanted for many persons during very short intervals and, therefore, it is unwise to restrict unnecessarily either the room area or the service counter length.

As regards cooking apparatus, in small centres a large gas or electric cooker will generally suffice for all purposes, but in larger centres a hot-water boiler and/or urns will be necessary. For any scheme providing full-meal service the apparatus will have to be installed on a much more generous scale and will normally follow that required in school or restaurant kitchens.

It is advantageous to plan the kitchen adjoining the main rooms to be served, for example, the hall, club rooms and to separate these rooms from the kitchen or servery by means of sliding or rolling shutters closing the remainder of the opening above a counter ; care must be taken to reduce the passage of sound (such as washing-up of china) penetrating to the main rooms, and therefore a heavy shutter should be installed and, on occasions, it may be necessary to cover the opening with a heavy curtain.

Figure 23 illustrates a lay-out based on the planning of the kitchen adjoining an assembly hall, but it also has the main club room on its other side connected by a service hatch, and adjoining is also a main corridor by which means rooms of lesser importance may be served. The main equipment necessary, except where full-meal service is to be provided, in addition to the cooker and urns, comprises a sink or sinks with ample draining boards, a large table, large cupboard space for the storage of china, glass and cutlery and shelving for the assembly of prepared food ready for distribution. This shelving accommodation can be added to by the area of the service counters and hatches and under-counter shelving.

Care should be taken to control the heat and smells from the kitchen, especially to prevent penetration to the hall or club rooms ; this usually may be achieved by means of an extract fan in one of the windows and/or extract ducts placed over the cooker and sinks. The second part of Figure 23 gives in greater detail the typical service counter between a kitchen and an assembly hall ; this counter should be not less than 3 ft 3 in high above the floor for convenient service and is made 3 ft wide in order to provide space to stack supplies ready to serve quickly. The opening is shown closed with a roller shutter covered by a curtain on the hall side.

The amount of provision for food storage is likely to be very small in most schemes and it may be that in very small schemes none will be needed ; it is only where continuous and regular or full meals are served that normal larders and stores are required.

A good service entrance, well screened from general view, together with an enclosed yard, is most necessary ; roadway access to this yard is desirable and in larger centres is essential, and it should be provided with adequate turning space for vehicles ; the same roadway should serve also for fuel deliveries and refuse removal.

Clinic—It may be very advantageous to attach a clinic to the community centre, and in order to save the erection of an entirely separate block, some of the ordinary rooms may be adapted for the purpose, thus combining the clinic with other activities of the centre under one roof. The clinic may be concerned with the health of the whole family, but it is more likely to be confined to infant and maternal welfare in conjunction with the women's clubs, such as the Women's Institute and Mothers' Union. As the activities of this work mostly take place in the morning and the afternoon and not during the evening, rooms may be used which in smaller centres will serve other purposes during the evening. A large club room or even the hall may well serve as a general waiting-room and lecture room. Where, however, a separate suite of rooms or a wing is devoted to clinical activities, specially designed rooms must be available which are not used for other purposes. Lavatory and W.C. accommodation is essential adjoining the waiting-room or any room used for the purpose. A room is required for use as doctor's consulting room which should be at least 180 sq. ft. and should adjoin the waiting-room ; this room must be equipped with a sink or basin with hot and cold water. A small club room may serve as doctor's room if it has a sink or lavatory basin. A nurse's room is not always necessary, but its provision is certainly desirable ; the room should have a similar area to that for the doctor. A separate weighing room is usually provided, although part of the main room or waiting-room might be used, but if dental or minor operations are carried out, the weighing room can also serve as a recovery room if made large enough for one or two beds or couches. Dental treatment or minor operations requiring the use of a recovery room would probably not take place at the same time as the weighing of children, thus the room can be used for both purposes. A sink or lavatory basin is desirable in this room. The other important room is one which may be used for either (or both) dentistry and ophthalmic work. For both purposes, hot water, gas and electricity services are needed. The room should be at least 180 ft super and if used for eye-testing should have one dimension (which may be on the diagonal) of not less than 20 ft.

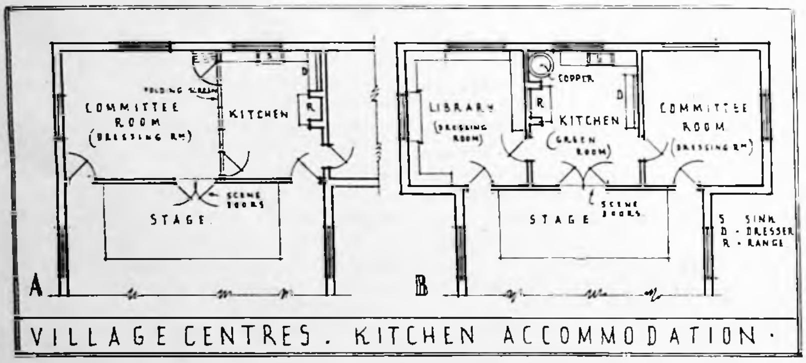


Figure 22

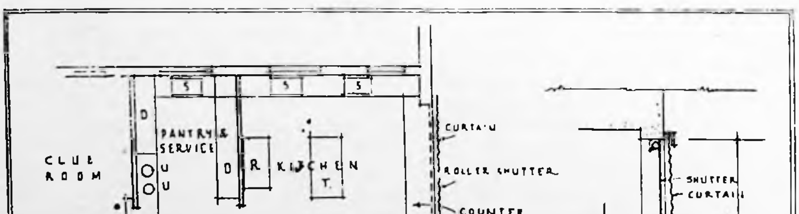


Figure 23

In addition to the rooms enumerated above for particular purposes, all of which might be normal rooms of the community centre adapted for those uses during certain hours of the day and may be used at other times as club or class rooms, there should be a dispensary and store opening out of it in which medicines, medical appliances and materials and such goods as infant foods may be stored and distributed to those attending the clinic. A dispensary requires a considerable amount of shelving, a sink with hot and cold water and a working bench or table steady enough for weighing apparatus; the needs of the store are chiefly shelving.

Figure 24 illustrates diagrammatically the essential relationships of the various rooms forming a typical clinic. The waiting-room must give access to all the rooms and lavatories; the doctor's and dental rooms should both connect with the recovery and weighing rooms. Detailed information on the planning of clinics is given in the section on this subject.

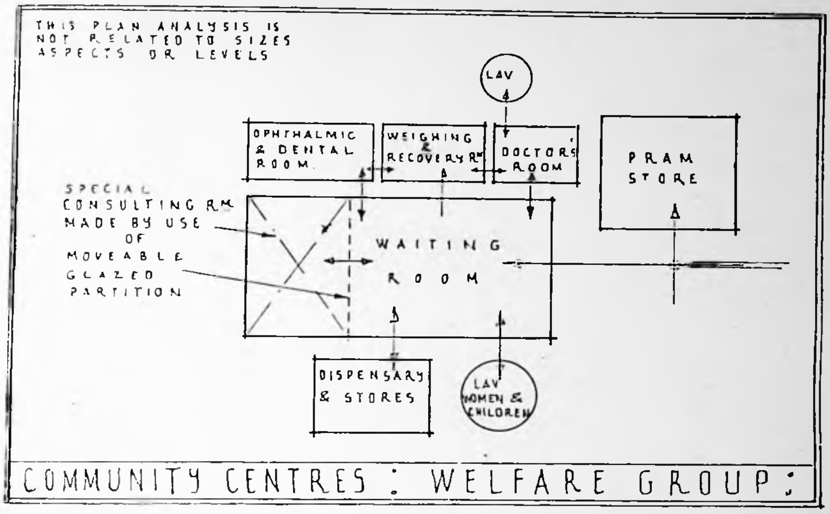


Figure 24

Covered perambulator storage should be provided and, if possible, a room in which children may play while waiting for the mothers and other children who are receiving attention at the clinic. Information on planning for perambulators is given in "Schools," in Figure 13 of that section.

8. *Factory Buildings*

Introduction—Factory design has progressed beyond the mere provision of structural necessities, but the value of accommodating machinery and operatives in surroundings which are at once attractive and suitable to their purpose is not as fully appreciated as it should be ; for, although highly expensive machinery is considered essential by manufacturers, the building that is to house it is frequently given too little attention. The day is passing, however, when manufacturers are content to use badly lighted, heated and ventilated structures, which only, at the best, keep out the weather.

Factory buildings must be designed round purely basic requirements, and the architect, especially in the general lay-out, must discuss with the owner, and fully understand, the processes and their sequence in each individual scheme in order to design the most suitable order for the arrangement of departments. Every factory has its own problems and consequently there are only a few basic principles which apply to all schemes. The line of production from the entrance of raw materials to the dispatch of the finished article must be continuous and direct. Cross traffic from one process to another must be avoided. Provision must be made for possible expansions or changes in the manufacturing process. Plenty of natural light is essential for most departments and good ventilation should be studied if satisfactory working conditions are to be provided. Plans should be simple and not influenced by a desire to produce elevations of symmetrical or otherwise preconceived character. Clear open spaces should be aimed at for freedom in every direction ; unnecessary roof or ceiling supports must be eliminated or unit planned ; rearrangements of plant and future expansions must be visualised at the initiation of every scheme.

Site—Too frequently the architect is not consulted before the site for a factory is purchased, but if he is fortunate enough to be called in before the purchase there are certain outside considerations which will influence the selection in addition to features of the site itself. Among these considerations are such matters as the proximity to a good labour market providing types of workmen that will be needed, residential facilities for employees, either in an existing town or village, or where suitable housing may be provided, transport facilities for personnel, raw materials and finished goods, adequate systems of water and power supplies and sewage disposal and last, the proximity of sources of raw materials and markets for finished products. An important factor affecting the plan is the regularity of deliveries of supplies, and whether the disposal is regular, or only seasonal, as these points affect very greatly the requirements of storage space to be provided. The main lay-out of the units of the plan of any factory must be made in relation to the means of access to the site and is dependent on the method by which the raw materials and finished products enter and leave the works. In some cases road access only is available, in others road and railway are used and in some, road, railway and river or canal, or any two of them. The placing of approaches from each of these services must be considered in relation to the other and in relation to the dependence of each process on the various services available ; for instance, in one factory all raw materials may arrive by water and leave by railway, whereas in another the reverse may take place, yet in others raw materials arrive by railway, but finished goods leave both by road and water. Figure 1 illustrates six typical sites in relation to the means of transport and the way in which the position of the system of transport influences lay-out of the general direction of the manufacturing process through the factory. Type A has road facilities only and therefore the entrance and exits from the site are placed together, with the general circulation passing round the site. Type B again depends on road transport entirely, but by confining entrance of goods to the one road and their dispatch to the second road, the progress in the workshops is diagonally across the site. Type C has delivery and dispatch from two sources, namely, road and railway placed at opposite sides of the site ; this complicates general lay-out, unless the delivery from one source, the railway, for instance, is a single material such as coal, when the lay-out becomes easier. In this example the final processes must be so placed that dispatch can be made either by railway or by road without crossing the general circulation. Type D is much more complicated, as three transport systems are being used for both arrival and dispatch, each placed on a different side of the site ; it is therefore impossible to avoid at least one cross-over in the circulation, which is shown, as for instance, arrival by railway across dispatch by river. Type E also necessitates the crossing of a circulation route, as a railway siding by which arrivals and dispatches are made, enters the site and adjoins the roadway, therefore the general circulation is round the site in an anti-clockwise direction with the dispatch by road crossing the arrival by railway. Type F is similar to Type E, except that the lay-out is based on the necessity for considerable storage space near the road entrance and on the fact that rail deliveries can be made away from the road entrance.

Figure 2 shows a typical analysis of a factory plan to show the circulation routes of the site in relation to the various blocks of buildings. The entrances for employees and goods are

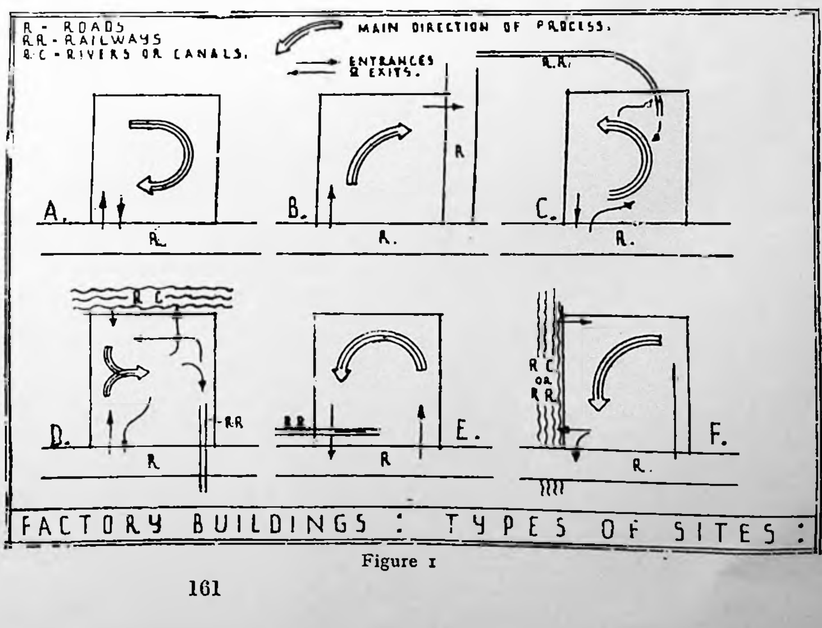


Figure 1

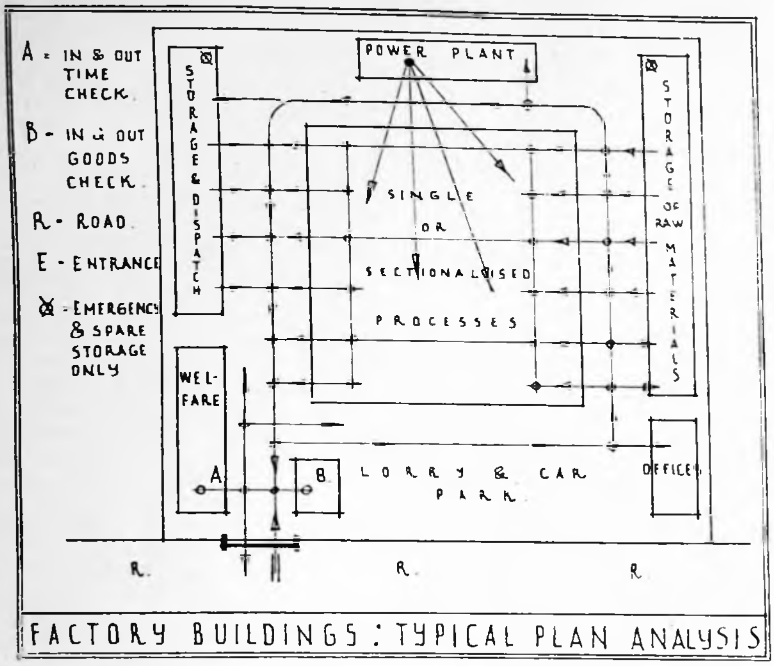


Figure 2

placed near one another, but controlled on opposite sides of the entrance way. A car or lorry park is placed near the entrance and is also adjacent to the offices. The vehicles circulate completely round the site in one direction ; there are no cross circulations, but some storage for raw materials and goods for dispatch are separated from the main factory block as the main bulk of deliveries and dispatches are directly to and from this block. The power plant is placed so as to be near to processes requiring the greatest amount of heat or steam power. The general lay-out is similar to Figure 1, Type A, but reversed.

Figure 3 illustrates a further typical lay-out. This example varies from that shown in Figure 2, as there are two methods of transport and some cross circulations are necessitated. The employees and road traffic enter together on each side of one control office, a slight advantage over the system shown in Figure 2. The lay-out is designed for delivery of coal and raw materials by rail, and the main dispatch by road, although small quantities of goods may be dispatched by rail, which necessitates the cross circulations shown ; these may be overcome if necessary by means of bridges or tunnels, if the road traffic is likely to be so continuous that traffic would be hampered.

Welfare buildings are usually placed near the entrance, as in many processes employees wash and change their clothes for working hours. These changing rooms then become part of this section, so that employees only circulate in their ordinary clothes immediately on entering and leaving the factory grounds.

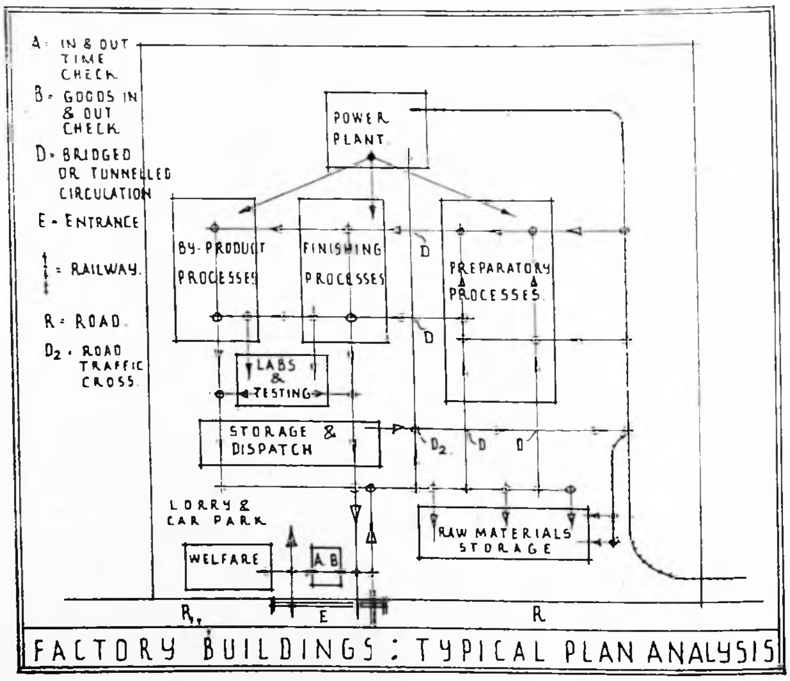


Figure 3

Process Buildings—The types of buildings required for manufacturing processes may be divided into two main groups: single- and multi-story buildings. Both of these groups, in particular the former, have many variations of form due to types of construction and roofing. The selection of type is dependent mainly on the product with which each factory is concerned and the method of circulation during the various manufacturing processes. At one time the single-story type was general for all purposes, but with improved methods of handling goods and the use of high-speed lifts, hoists, chutes and conveyors, many processes are more conveniently dealt with in multi-story buildings. Single-story factories are general for handling heavy goods, but this problem does not affect the majority of processes. Land value has a direct bearing on the number of floors to be used and organisation becomes more expensive when the area to be controlled is very large. Single-story buildings providing a given area of floor space generally cost more to construct ; single-story buildings covering large areas are more difficult to heat and ventilate. If properly designed, there seems to be no difficulty in using machinery on upper floors, in spite of weight and vibration. Single-story structures have an advantage in that clear spans between supports, if needed, may be much larger than those of multi-story buildings. Many manufacturers build single-story buildings, providing for their future extensions to be made as multi-story structures over the whole or part of the first building.

The Section—The effect of the process lay-out on the section is a primary consideration when the selection of type of building to be used is under consideration. Figure 4 illustrates a number of typical sections showing variations resulting from the lay-out for a particular process. Type A is the straightforward single-story lay-out in which raw materials enter at one side or end of the building and circulate across. Type B shows a multi-story building in which different articles are made on each floor, or in which the same processes take place on each floor. Type C is a two-story type in which the same raw materials are handled on the upper floor and are fed to varying processes

or to several sets of machines doing the same processes on the lower floor. Type D is a multi-story type in which the raw materials are hoisted to the top floor of the building and pass from floor to floor in a continuous circulation through the building during manufacture. Type E shows a combination of the types described above. Such a combination may arise where the commencement of the process involves the hoisting of materials to silos or top floors of a high building; or where the process begins with a series of operations needing continuous handling on the same level, the goods being subsequently lifted to one of the upper floors for packing purposes, or to the top floor for further gravity processes or for storing.

Figure 5 illustrates a number of typical sections of single-story factory buildings to show the various methods of roofing and the necessary supports required to carry roofs. Type A is the ordinary equal-sided truss type which has often been used with a part of each slope glazed. Large spans are not economic with this type of roof and the factory must be planned with the axis placed north and south; otherwise the south light or direct sunlight is too strong in the building and is unpleasant for the workpeople. The glass in this type is difficult to clean. Type B is the ordinary "north-light" truss section which has produced the saw-tooth skyline associated with factory buildings. Large spans of fifty or sixty feet between supports are not very economical with this type and the lighting is not over satisfactory, while window cleaning is difficult as the only access is along the narrow valley gutters between the trusses, which are themselves a frequent source of minor troubles. Type C is based on a system of clerestory lighting formed by raising the trusses on lengths of vertical lights; the system also calls for east and west lighting. This type allows ample head-room for overhead hoisting tracks, especially when travelling-crane cages or control cabins, and space for ducts, etc., are needed in the central portion. The windows are vertical and can be cleaned easily from the flat roofs, and also the whole of the window area can be opened easily, which is very difficult with Types A and B. In this type, fairly large spans are possible. Type D is the adaptation of the "north-light" truss for east and west light and has advantages over two spans of the north-light type, giving better lighting over a larger area of floor space. The windows are accessible from the flat roofs on each side and difficult gutters are avoided. The number and spacing of supports needed for the trusses are dependent on the span, but by use of deep beams or lattice girders the number of the central row may be greatly reduced, if necessary. Type E is somewhat similar to Type D, except that the spans are reduced to allow lattice cross beams to be introduced, entirely eliminating the central row of supports; this type can be used to give very large, clear central spaces. The depth of the beams gives a continuous row of ventilators, above which are the windows. The outside bays can be made very wide if the window heights are raised high up, as indicated on the figure, so as to light back a considerable distance; if, however, this is not necessary, the side roofs may be flat. This type is readily adaptable to concrete truss construction by using a flat roof over the central span and eliminating the cross beams. When east and west lighting is used, direct light should be diffused by the use of prismatic or ribbed glass which should be of the heat-resisting type, although the latter cannot be used when trueness of colour is very important as a process factor.

Good ventilation is a great asset to factory life, but in many schemes a system of artificial ventilation is not an economical or a necessary proposition, in which cases types of roof

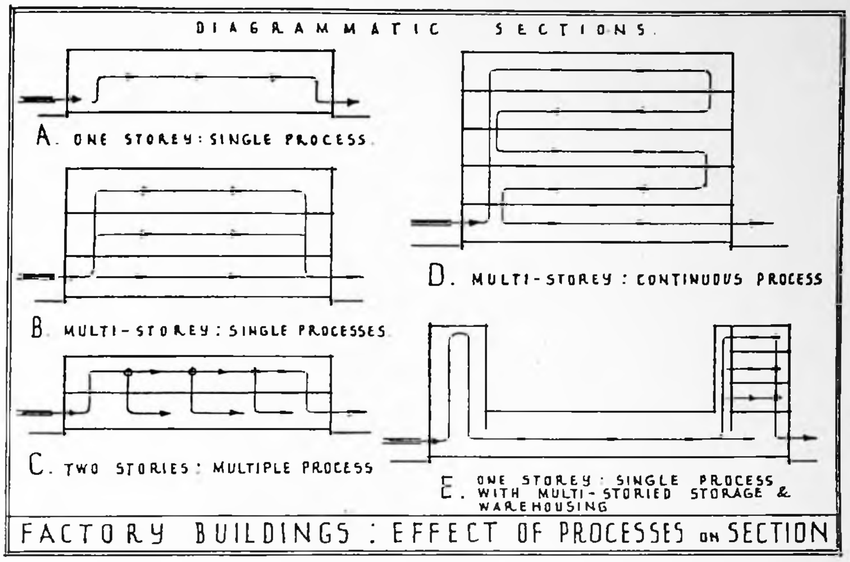


Figure 4

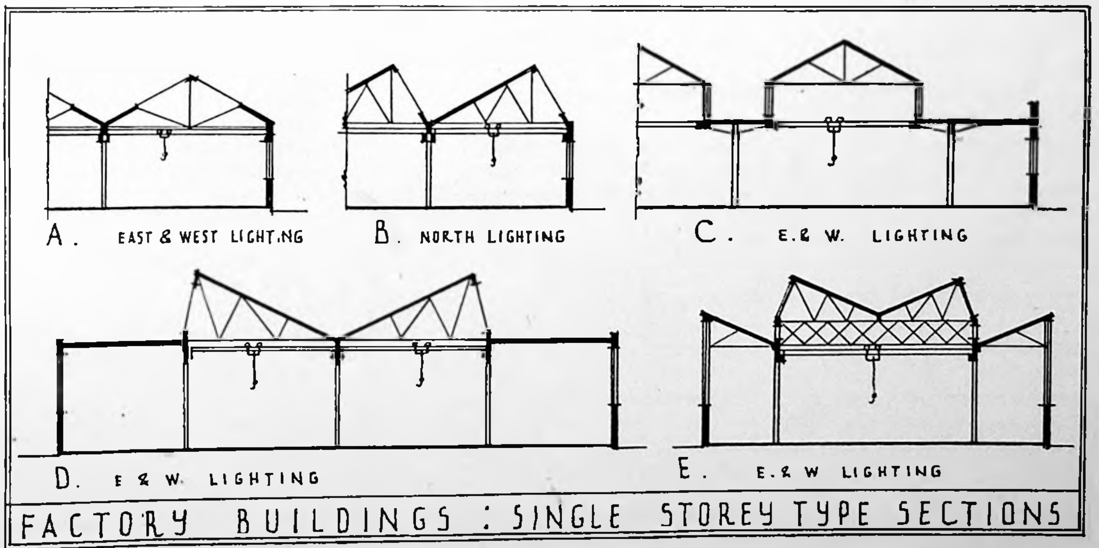


Figure 5

F***

section which can allow easy opening of the whole, or at least a considerable part, of the glazed area are an advantage, as in Types C, D and E. In many factories the windows are opened mechanically in continuous lengths up to 500 or 600 ft, giving a maximum opening of about 70 degrees.

The shape of trusses to carry the roofing is to some extent dependent on the span to be covered, but there are also other factors to be considered carefully, such as provisions for cranes, special lighting requirements, amount of clear space between supports for trusses and the actual type of covering to be used. For general purposes trusses should be placed 10 to 15 ft apart for economy in purlin construction and roof covering, but various factors influence dimensions, as, large door openings and weights to be borne by gantries if carried on the same supports as trusses. Heights for roofs with pitched trusses should be not less than 10 ft to the eaves, but in most schemes height is dependent on clearances required for cranes and tall machines. Greater height is desirable from the point of view of hygiene, but it increases initial costs of walls and stanchions as well as running costs of heating and ventilation systems.

In most single-story schemes steel trusses seem to be a more rapid and easily adaptable form of construction than concrete except in some examples where upkeep is a very important or difficult factor ; reinforced concrete also makes for a reduction of fire risk.

Multi-story Buildings—Multi-story buildings have certain advantages and disadvantages over single-story buildings after the essential process plan has been considered and it is proved that a multi-floored building may suit a particular industry. There may be increased advantages due to compactness assisting distribution of motive power, heating, ventilation, supervision and accessibility.

Some more important disadvantages are loss of area needed for lifts, staircases and chutes, possibility of providing top light on the top floor only, small areas clear of columns and the need to provide for fire escapes. The width of the building is largely dependent on the area of window available, which in turn is controlled by the height from floor to ceiling of each story. Big spans should be avoided, as the cost increases after a certain economical span by the square instead of in direct proportion. The heights of stories generally vary from 12 to 15 ft from floor to floor ; window areas should be from 30 to 35 per cent of the floor area. Some factories can be increased in span where provisions for storage may be needed in the central or darkest part of each floor. When high fire resistance in multi-storied buildings is a particular requirement, reinforced concrete construction is often found to be less expensive than encased steel framing. Slab and beam construction in concrete or steel is usually cheaper in factories where spans are narrow, but for larger buildings " mushroom " construction is better, particularly due to the flat ceilings thus possible. Figure 6 shows several types of multi-storied buildings. Diagram A illustrates the beam type of construction which does not give a level surface on the underside of the floor unless a false ceiling is used, and therefore presents difficulties with suspended shafting and pipe lines. A further disadvantage is that it is essential to have piers on external walls, which interrupt continuous glazing, and therefore cut off valuable light. Moreover, the beam over the window does not permit of the windows extending to the ceiling level, and this reduces the depth of well-lighted area from the window wall, and also reduces efficiency of ventilation. Diagram B illustrates the " mushroom " type of reinforced concrete construction, which gives the flat ceiling so desirable for fixing shafting and services, and at the same time does not require structural supports on the external faces of the building, thus allowing a continuous surface of glass as external walls if required ; but in any case, even if continuous glass is not required, the windows may be carried up to the ceiling level. In some areas the amount of the glass area is limited to a proportion of the total area of each façade.

Type C shows a half-section through a factory building in which the main supports are not placed in the external walls, but a part of the floor area is cantilevered from the supports, similar in most ways to the " mushroom " type. This figure also shows a method of lighting wide factory buildings by the introduction of a large covered light well which lights cantilevered galleries and the ground floor.

Type D illustrates a combination of a multi-storied unit and a single-storied unit or units, the height of each part being dictated by the processes carried out in them. It is wise that a single-story building adjoining a higher one should have a flat roof which will not cut off light from lower floors of the taller parts.

Floor levels should be continuous, as ramps or steps interrupt easy communication. Windows are usually kept about 3 ft 6 in above floor level, and parapets or railings must be placed round all openings in floors and round galleries. Kerbs should also be placed round all openings and galleries to prevent tools, etc., being dropped or kicked on to the floor below.

The Plan—The sections of factory buildings have already been discussed, but it is necessary also to consider them in conjunction with plans of buildings the shapes of which are also largely governed by the processes.

Figure 7 illustrates several types of plan arising from varying processes, and the relative order of handling goods from arrival and to departure. Type A shows a factory into which goods enter into a large common store and pass through three dissimilar processes from which dispatch is separate in each case. Such a scheme requires a long building linking the three process buildings planned with their axis at right angles to that of the storage building, and separated to allow easy circulation of delivery vehicles.

Type B shows a factory in which all processes take place under one roof. Raw materials enter into a common store and pass through one of two processes, to be packed together at completion. Type C shows a scheme in which a large building area is needed. Goods enter at one end and

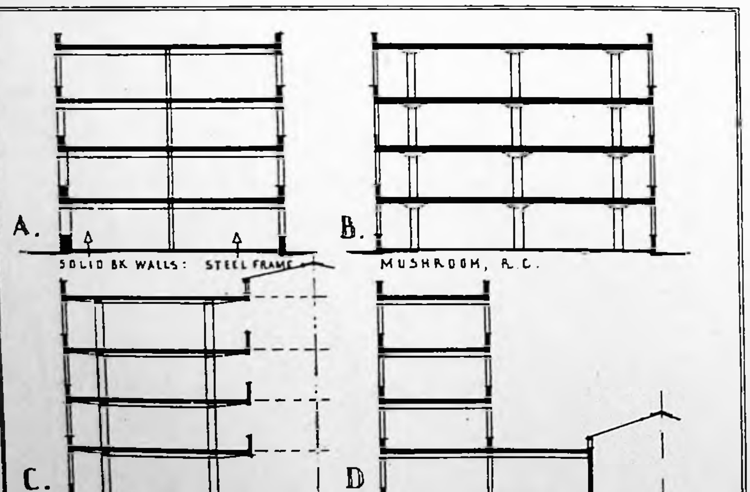


Figure 6

leave the other end of one block or part of the building, but are manufactured in a series of parallel processes.

Type D shows a factory where raw materials arrive at three separate stores, each passing through its own process shop to an assembly plant where products of the three shops are put together to form finished articles for dispatch from one packing shop. The relationship of the arrival, processes and final dispatch of goods not only influences internal lay-out of shops, but also controls the general lay-out of all buildings which make up a complete factory. Type A is a series of small-span buildings attached to one another, whereas Type C requires a large clear area placed against a smaller-span building. Each example shown in Figure 7 might also be either a single or multi-storied building.

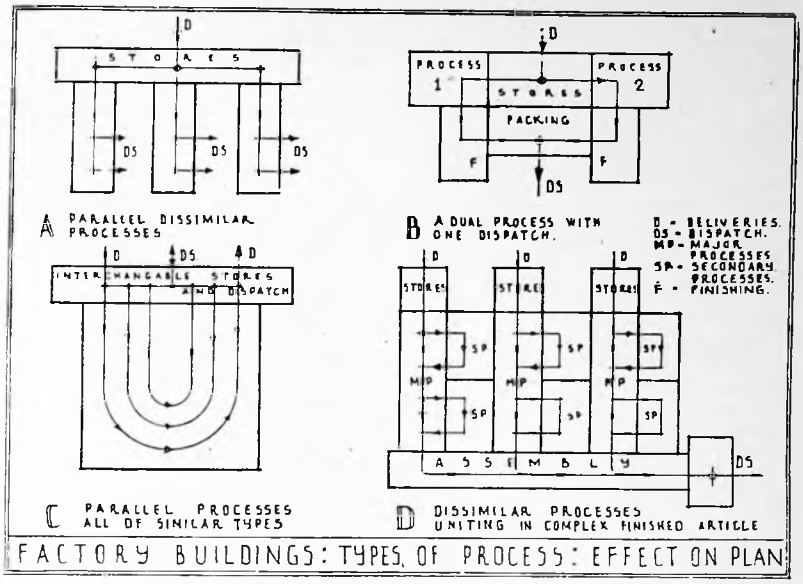


Figure 7

Lifts, etc—The provisions required for handling of goods at arrival, during processes and on leaving the factory have a definite bearing on the plan of each building and particularly on heights, bay widths and sizes of door openings. Lifts are installed in the majority of multi-storied buildings for transport of goods and less frequently for carrying employees. Goods lifts should not be designed for faster speeds than absolutely necessary. A large margin of load is a wise provision in new installations to guard against mishandling or future changes in weight of goods to be handled. Lift wells must be enclosed with guard rails and wire mesh for their full height, and in some districts by-laws require lift wells in fire-resisting buildings to be enclosed in incombustible materials with fire-resisting doors or shutters; in some circumstances, particularly where the lifts are in the centres of fire-resisting staircases, the enclosing walls of fire-resisting materials may be limited to 4 ft above each floor level and the remainder of the height enclosed with wire mesh.

Goods lifts should not be placed in staircase wells, nor be placed near, or connected directly to, escape staircases. The sizes, shapes and travelling area of all hoists, chutes and conveyors of all types must be known in the early stages of preparation of the scheme, as affecting steelwork, loading of supports or trimming of floors and the lay-out generally, by fixity of certain areas and positions on each floor; such considerations, however, do not necessarily arise to the same extent in the case of chutes and belt conveyors. All conveyors, belting and moving parts of machinery have to be enclosed as a safeguard against accidents. The sizes required for transport apparatus vary too much with each trade and process to permit of useful figures being given, but from the designer's point of view much more space than is at first anticipated is usually required for trucks, trolleys, loading platforms, etc., where goods wait at the start and finish of each operation.

Means of Escape—Full provision must be made for escape in case of fire and for other accidental reasons in certain trades. Each building is generally treated by the various official regulations on its own merits, with special reference to the number of employees, type of materials in use, fire-alarm system and surrounding property. Generally, in multi-storied buildings at least one enclosed staircase and exit are required, in addition to an alternative means of escape such as a similar enclosed staircase, a staircase in another block to which access is given by doorways in division walls, external balconies giving access to adjoining buildings, or an external iron staircase. All alternative escapes must be permanently fixed in position and not such that require manipulation to be put into use. Clear gangways must be provided to all staircases and exits and doors must open in the direction of the exit and be clear of steps. Upper parts of doors should be glazed with transparent fire-resisting glazing. Windows on upper floors facing roads or open spaces should be made to open easily at sill level and have one opening area at this level sufficiently wide and high to allow a fully-grown person to pass through in case of need.

Staircases—Fire-escape staircases inside multi-storied buildings, together with the lobbies and landings, should be enclosed with 9 in of brickwork or similar fire-resisting materials. Floors to landings and lobbies and steps must be of approved thicknesses. Some authorities will only require one staircase in each block to be of concrete or similar incombustible materials, and the remainder may then be of fire-resisting hardwoods if the minimum thickness is not less than 1¾ in. Generally, internal staircases should be against an outside wall and should have adequate natural light and permanent ventilation. Treads should be not less than 10 in wide, clear of nosings, and not more than 7½ in high. Continuous handrails are necessary on both walls. Doorways and staircases should be at least 3 ft 6 in wide and must be increased to at least 4 ft 6 in if used by more than two hundred persons, or one hundred persons on any one floor. Winders should be avoided, and each flight limited to fifteen steps with landings at the top and bottom of each flight. External staircases and gangways must have a balustrade 3 ft 6 in high, with balusters not more than 6 in apart. Windows or other openings near escape staircases may be required to be glazed with fire-resisting glazing in fixed sashes.

Loading Docks—Proper loading and unloading docks are required in connection with the majority of factory buildings, either for use with motor vehicles or railway wagons. There are two types which are in general use for motor vehicles, as shown in Figure 8, A and B. Type A has separate bays formed for each vehicle, and Type B consists of a continuous raised platform against which the vehicles back in normal circumstances, though the vehicles may draw alongside the platform if required. Type A has the advantage that unloading may take place from the sides of vehicles without disturbing the general flow of traffic, as might happen with Type B. It is usual to raise the platform of the dock about 3 ft 6 in above the road level, unless "low-loading" types of lorries are to be used. It is wise to provide a covering over the loading dock and at least 3 ft of the area occupied by the vehicles as a provision against wet

weather; the covering should leave a clear height of at least 18 ft to allow for the highest vehicles on the road (16 ft) to pass under it and leave some space for light to circulate or to fix "bulk-head" artificial lighting under the canopy. The loading docks are sometimes placed inside or partially inside the general area of the building, but if not, the covering should be mainly glazed to light the work-space behind the standing vehicles. Figure 8C illustrates a loading dock for railway wagons, for which the platform is rather higher than for road vehicles. The space between the rail track and the dock is wider than required for the wagons themselves, but is bridged by the drop sides of the wagons.

Figure 9 shows the maximum dimensions of commercial motor vehicles. The overall sizes will affect dimensions of garages, loading docks turning spaces, curves on roadways and approaches. Ample clearance should be added to the dimensions given in the figure, as these are actual sizes of the vehicles themselves; especially must allowance be made in connection with the turning spaces, where at least 18 in should be added to provide a dimension to the kerb of a roadway; still more room is needed if there is a building adjoining unsurrounded by kerbs and footpaths.

that the materials and equipment for cloakrooms should lend themselves to easy and rapid cleaning, and that adequate ventilation and lighting, both natural and artificial, be provided. Large cloakrooms should be in charge of an attendant, as unless there is some person in charge, workers are often unwilling to leave their property for fear of theft. Lockers tend to overcome the risk of theft, but their first cost is rather high compared to other systems of equipment.

Position of Cloakrooms — Two general positions for cloakrooms in factory schemes: firstly, general cloakrooms, one for each sex, near the workers' entrance and exit to the factory, and, secondly, small cloakrooms attached to each "shop" or department. The former seems to be the most satisfactory, in practice, for the majority of factories. It is very convenient if cloakrooms are so placed that circulation through them is essential to reach the works from the workers' entrances, especially if workers are able to keep under cover during wet weather after the removal of their outdoor clothing. Cloakrooms should be laid out in such a manner that there is continuous circulation, entrance and exit doors being kept separate. The important factor in placing equipment is to allow sufficient space for removal of clothes without causing overcrowding during rush times.

Lay-out of Cloakrooms—Equipment may be arranged either for direct access by the workers or for the cloakrooms to be cut off and the clothes handed to attendants. The former appears more efficient if the workers have to change clothing in addition to the mere removal and storage of outdoor garments; also, this system requires only one attendant for control purposes, whereas the handing-in system requires a number of attendants at opening, closing and meal times.

Lockers have many advantages, especially if workers wish to leave clothing and shoes at the factory. A disadvantage may be that the lockers are kept shut more or less continuously and are only occasionally cleaned out inside; it is essential that they are well and permanently ventilated. Figure 10 illustrates the general lay-out of three types of cloakroom. Type A shows the use of the open-access type of rack with pegs. In this case the employees pass from the entrance to the factory, depositing or collecting their clothing as they pass through. Racks should be placed at least 3 ft 9 in apart, with pegs on each side; but if boot and shoe lockers are also needed, the spacing must be increased to at least 7 ft, the tops of the boot lockers being then used as seats, and to 8 ft 6 in if separate seats are placed in the centres of the gangways. A space of at least 5 ft should be given at each end of peg racks for circulation. Type B is the enclosed type where clothing is handed through hatches or openings in a wire-mesh enclosure and hung up by attendants. In this type the clothes racks may be placed closer together as attendants do not require so much room as the employees in Type A; the spacing of the racks may thus be reduced to 3 ft centre to centre of double-sided racks. The enclosure in which the clothes are

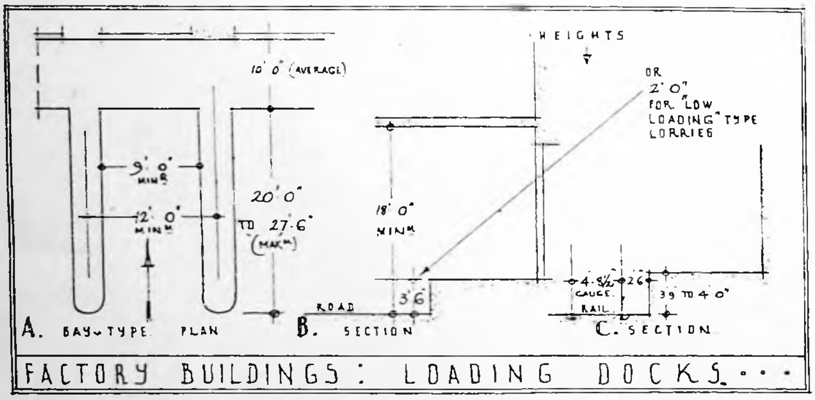


Figure 8

Toilet Facilities—In many industries, cloakroom accommodation has to be provided in addition to facilities or washing and sanitary accommodation. Even when such cloakrooms are not compulsory, they are a desirable provision in all schemes; in some factories outdoor clothing has to be removed by all workers and kept during working hours. It is essential that a place of safe keeping be provided and, if possible, some provision made for drying clothes in wet weather. Frequently, workers wish to change into different clothing when working and in some factories "protective clothing" has to be worn.

The essential provisions for an efficient factory cloakroom are, firstly, separate pegs or lockers for each worker marked by a number; secondly, ample space for changing clothes and boots. It is important

Figure 9

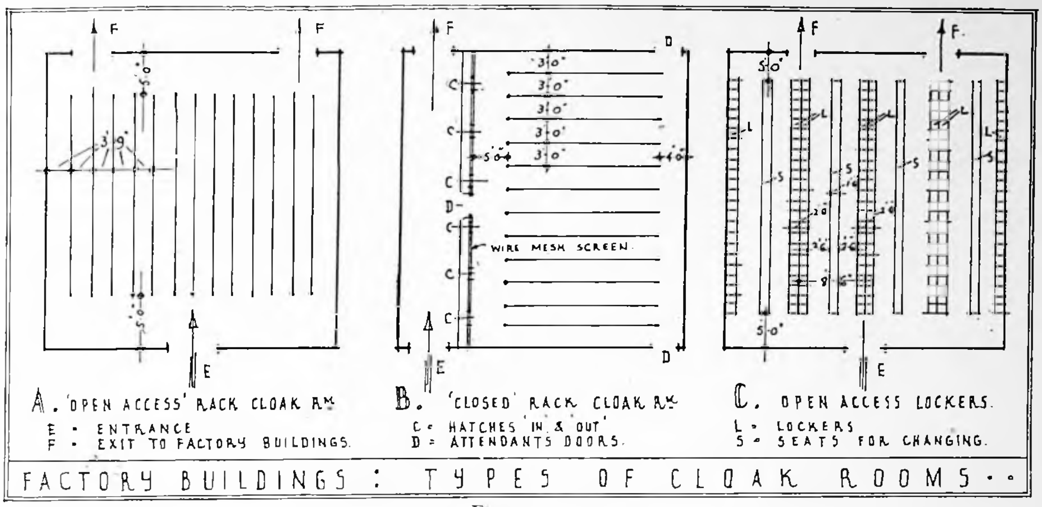


Figure 10

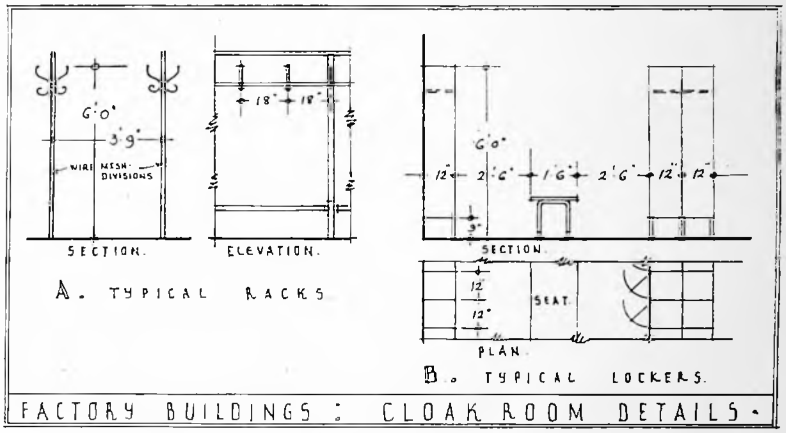


Figure 11

placed should be constructed of wire-mesh on metal framing to allow maximum light and ventilation.

Type C shows a cloakroom based on the use of individual lockers, which are generally about 12 in by 12 in each and constructed of metal with a wire-mesh bottom, so that heat and air may enter and pass through the fitting to top louvres or through a wire-mesh top. These lockers may either be used without seating accommodation, with a seat rim projecting from the locker (in which case it is raised 15 or 18 in above the floor), or with seats, fixed or loose, placed between two ranges of lockers; this latter arrangement requires a spacing of at least 8 ft 6 in, centre to centre, between rows of lockers placed back to back as in Figure 10 C. Hot pipes should be placed below each row or double-sided row of pegs or lockers; to dry clothing and to eliminate steam and the smell of drying clothes, good cross-ventilation is essential.

Another method of clothes storage in lofty buildings is to suspend the clothes on hangers from racks attached by pulleys to the roof or ceiling. The clothes may thus be placed in gangways or corridors in the wash-rooms, or even in the workshops themselves, without waste of space during working hours; or increased use may be made of cloakroom space if the hanging racks are not placed directly over other racks standing on the floor. The clothes in this position are safe from pilfering. Radiators for clothes-drying may be placed on the floor under each suspended clothes rack.

Figure 11 illustrates the spacing of cloakroom equipment. Pegs for hats and coats should be placed 18 in apart if possible, in order that clothes should not touch one another. Pegs should project away from walls or divisions to permit good circulation of air round the clothing. Wire-mesh divisions are desirable in double-sided clothes racks. Lockers are generally standard metal productions which vary in size considerably; they should be 6 ft high and at least 12 in by 12 in, and although smaller sizes are sometimes used, the saving in cost is not really justified. Seats or benches should have teak tops carried on metal supports. All fittings should occupy as little floor area as possible up to a height of 6 in above the floor level to permit of washing the whole floor. Floors are frequently of wood blocks and sometimes of granolithic or similar impervious materials.

Lavatories—There has been a great increase, in recent years, in the number of factories providing washing facilities, in addition to those factories where, by the nature of the trade, it is compulsory to provide such facilities. The system which has proved most satisfactory in large factories is the provision of large circular troughs or long ranges of troughs to which is supplied a constant stream of water at a suitable temperature through sprays which are turned on when required. Individual basins with taps are apt to become dirty, especially where the taps are turned on by workers with dirty hands; if individual water control is needed, a foot pedal system is best. Soap presents a rather difficult problem in factory lavatories, as cakes of soap are so easily lost or removed. The best solution seems to be to provide liquid soap in glass containers fixed over each basin or trough, one to every two basins or washing spaces. Towels are also difficult to deal with as they get very wet and dirty when ordinary short roller towels are used. Some factories have adapted power-driven warmed-air hand-driers, and others provide absorbent paper towels and have found them to be satisfactory. In other examples each worker provides his own towel, and in others long roller towels on spring rollers have been installed so that each person may have a dry section and the wet parts roll up on another roller. (See also section on "Lavatories, Public and Communal.")

Baths—It is compulsory in some trades to install baths for the use of employees, but many factories also provide similar facilities when the work involves extreme heat or dust, or is exceptionally dirty. Generally it has been found that male workers prefer shower and douche baths, but that women like ordinary plunge baths. Separate foot baths are also provided in some factories where the

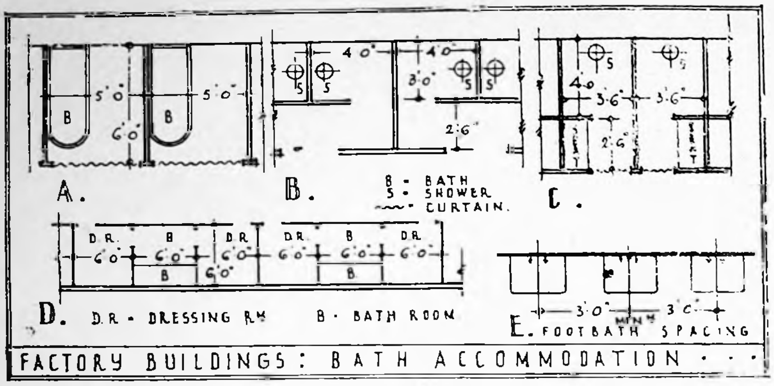


Figure 12

lavatories and cloakrooms, but in large factories additional conveniences should be situated conveniently accessible to the workers, as long walks involve too great a loss of time. Unless special artificial ventilation is installed, each convenience should have direct connection with the open air by means of a window, and should therefore be placed on external walls, although sometimes schemes are

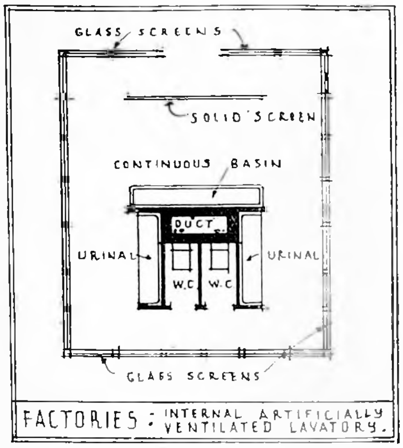


Figure 13

work involves standing or walking in dust or dirt. The number of baths is entirely dependent on the requirements of each factory, and is affected by the type of fittings to be installed; thus shower baths may be used by more workers in a given period than an equal number of plunge baths.

The compartment for each plunge bath should be at least 5 ft wide by 6 ft long, and for each shower bath 3 ft wide by 4 ft deep, the latter being exclusive of space for undressing. Partitions should be not less than 6 ft high and preferably rather more, but should be kept 6 in above the floor level for cleanliness.

Figure 12 illustrates various arrangements of bath fittings and partitions in factory buildings. Diagram A shows a plunge bath lay-out in which only dividing partitions are used and the front closed with a curtain. Type B is a shower bath layout in which screens are constructed in such a manner that doors are eliminated; if this type is used, dressing facilities are also necessary adjoining the shower baths. Type C is another shower bath arrangement in which dressing space is provided adjoining each shower; the dressing accommodation consists of a seat which is screened from the main part of the compartment by a curtain, and from the shower itself by a high partition, which should also have a curtain to close the remainder of the opening to ensure that clothes and the seat are not splashed by water. Type D shows an arrangement adopted for dressing-rooms attached to bathrooms; a bathroom is placed between two dressing-rooms, so that the baths are in use by the occupant of one dressing-room while the person in the other dressing-room is dressing or undressing. Type E illustrates the spacing of foot baths; these should be placed at least 3 ft apart, centre to centre, and preferably rather more. Duckboards of slatted construction are generally placed in front of foot baths.

Drinking Water—It is required that drinking water is available, conveniently accessible to all employees in all factories employing 25 or more persons, and in some industries in all factories, regardless of the number of employees. The supply must be clearly marked " Drinking Water." The recommended type of water-fountain is one with an upward jet, which ensures that water is not contaminated and also eliminates the need for drinking cups. Drinking fountains should be placed so that the jet is almost 3 ft above floor level. If two fountains are placed side by side they should be at least 3 ft apart, centre to centre.

Sanitary Accommodation—Suitable and sufficient sanitary accommodation is required in all factories and workshops by the Factory and Public Health Acts. The accommodation for each sex must be provided separately.

The Secretary of State has made an order under the Factory Acts requiring the following provisions to be made in all factories:—

(1)—Not less than one convenience for every 25 females and one every 25 males. If there are for more than 100 males, and sufficient urinal accommodation is also provided, there need only be one W.C. for every 25 males up to the first 100 and one for every 40 thereafter.

(2)—Conveniences must be readily accessible to the persons employed.

(3)—Conveniences must be separated from workrooms by the open air or by an intervening ventilated space.

(4)—Conveniences must be under cover.

(5)—Conveniences must be divided by partitions, and in the case of those for females, with doors with proper fastenings.

(6)—Separate approaches must be provided for each sex, with proper screening of the interior.

The essential accommodation should be considered to be the minimum requirement, and a larger provision is generally desirable up to one W.C. for every 15 persons.

Sanitary accommodation should, preferably, be connected with

approved where only top-light and ventilation are available to a room in which a number of conveniences are placed. If conveniences are placed adjoining a workroom a proper ventilated cut-off lobby is essential, and when a room containing a number of conveniences is placed adjoining a cloakroom, it is desirable that the dividing partition is carried up to the ceiling. Partitions between W.C.s should be carried up to 6 ft 6 in or 7 ft above the floor level, but should be lifted about 6 in clear of the floor for the purpose of floor cleaning. Each W.C. should be at least 30 in wide, and the distance from the front of the seat to the door should be not less than 30 in. W.C. pans of the wall-bracket type are the most satisfactory, and lift-up seats should be provided. If separate flushing cisterns are provided to each individual W.C., a rapid-filling type is essential. The trough type of cistern for long ranges of W.C.s has proved very efficient, as it ensures a constant supply of water for flushing and no time is lost in refilling the cistern before re-use. Partitions and floors should be of materials to withstand rough usage and be easily cleaned.

Artificially ventilated W.C. blocks have been used in a few instances in this country, but their use in American factory buildings is becoming usual. The advantages claimed for this arrangement is that the rooms containing the W.C.s may be placed in the centre of multi-floored blocks, where they are more easily accessible to the employees, and also they do not occupy external wall space on manufacturing floors, and consequently block out good daylight from working spaces. Figure

13 illustrates a sanitary block designed for artificial ventilation and placed in the central portion of the floor space; the ventilation is by means of the extract duct in the centre, which draws its air from the factory. It is enclosed in screens glazed with obscure glass, and being permanently artificially lighted inside the enclosure, vision from outside is obstructed. All the pipes for the various services are grouped on each side of the duct. The partitions dividing the sanitary block from the general factory floor space must be carried up to the level of the ceiling, or alternatively have a ceiling over at a lower level.

Welfare Buildings—In recent years the welfare of factory employees has been considered to be a matter of increasing importance and consequently much greater care has been taken to provide suitable buildings for the various services included under this category. These services include canteens or dining-rooms, rest rooms, clubrooms, first-aid departments, dental treatment rooms, etc. Grouped with some of these rooms, for convenience of administration, are sometimes employment offices, medical inspection rooms, staff records office, staff controller's office and rooms for similar purposes, the number and purpose of their use varying with the number of employees.

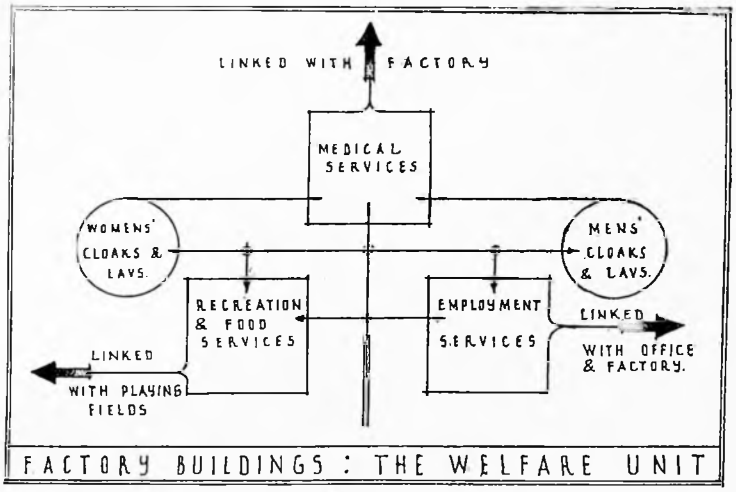


Figure 14

Figures 14 and 15 illustrate the basic relationships in diagrammatic form of the units which form the welfare and staff sections of a factory. These units, in small schemes, are likely to be grouped into one small building or even part of the factory building itself; but in large factories they may constitute a large building or a number of smaller ones. The services to be provided may be roughly divided into three units: employment services, medical services and dining and recreation facilities. The first unit is composed of offices dealing with control of staff, their employment and pay, and should, therefore, be placed near the administrative offices of the factory and also near the main staff entrance. The time clocks may also be near this unit and controlled by it. The second unit incorporates any medical services considered necessary, such as medical officer's room, with dressing and examination rooms for use in dealing with staff and applicants for employment, first-aid room and rest room, with two beds for each sex if both are employed, a room suitable for eye-testing and a nurses' room. In each of these two units cloakroom and lavatory facilities are needed for the controlling staff of each unit and for employees or public visiting the units. The third unit is used entirely by the employees and is, in many factories, a unit or building provided by the owners, but operated and managed by a committee of the workers. In large factories this unit has a series of rooms of varying sizes, each used in the daytime by a group or section of employees, such as male factory hands, female hands or clerical staff, as a dining-room. These rooms should be grouped round a central kitchen serving all rooms. The rooms are frequently divided by movable screens in order that after working hours a large room may be available for social purposes or smaller rooms for meetings, games, etc. Some factories provide, attached to their canteen, a number of small clubrooms for use of individual sections of the employees. The recreation and dining-room unit should, if possible, have close contact with any playing fields which the factory may possess in its immediate neighbourhood. The cloakroom and lavatories of the factory are sometimes near these units, but if the recreation unit is to be used after working hours, there should be additional facilities attached, if the normal factory cloakrooms cannot be placed close to it. It must be remembered that the lavatory, cloakroom and bath accommodation is all part of the welfare side of the factory, and a most important part from the point of view of the designer, as it is practically a necessity in all factories, whereas other welfare units may be provided in comparatively few schemes and these mostly of the larger type. The advantages of ample, well-planned, simple provisions for maintaining and improving the health of the employees should be impressed on all factory owners by the architect as a safeguard against loss of time due to sickness and uncongenial surroundings.

Figure 15 shows each of the three main units in greater detail than Figure 14 and shows the diagrammatic relationship of the main rooms which may be needed in a moderately large scheme, though many of the main rooms are needed to a lesser degree in almost all schemes. Larger factories tend to make a much greater study of applicants for employment and if pension and sickness schemes exist, medical examination becomes a necessity. In addition, tests are carried out as to physical and

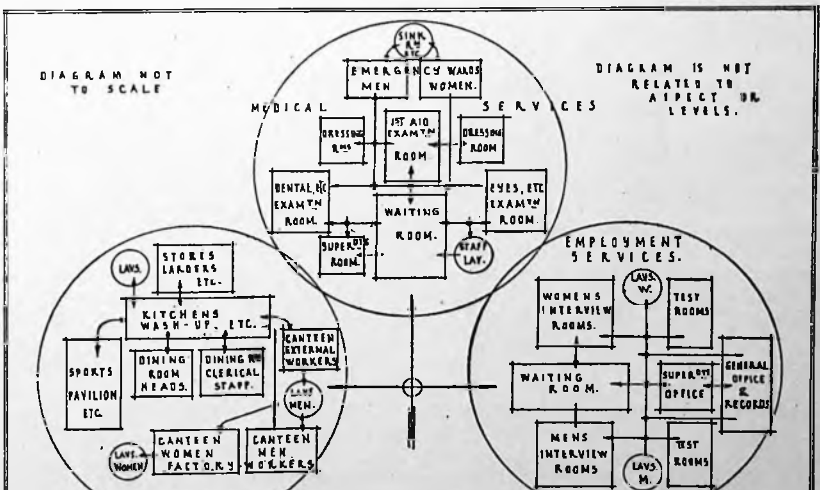


Figure 15

psychological suitability for the particular work required and therefore suitable interview and test rooms have to be provided. The staff records, pay sheets, pay offices, etc., call for an increasing amount of staff time, study and book-keeping and consequently need accommodation which may be better linked to the staff management department than to the general business administration offices.

Canteen—Of these units the canteen or dining-room in some form is a requirement of the majority of factories. It varies from a small room in which employees may eat the food they have brought with them to very large dining-rooms with elaborate facilities for cooking meals for large numbers and where the different branches of the staff eat in rooms allocated to them; directors, management, clerks, men and women employees having separate rooms. Canteens are essential in trades where it is dangerous to allow food to be taken into the workrooms.

The simplest type of canteen should be a room which is heated in winter and has some facilities for warming-up food by the employees themselves. As soon as numbers will permit, a mess-room attendant should be employed to clean and look after the room and, in addition, to do simple cooking such as making tea, coffee, etc., and warm up the food brought in by each employee. The requirements of the more elaborate type are considered later in more detail.

The size of room or rooms to be provided must be based mainly on the number of employees who live too far from the factory to return home to meals, but a large margin should be allowed in addition for fluctuations in these numbers, for in wet or winter weather, more will remain at the works and allowance should also be made for possible increase in staff numbers. The floor space required should be based on an allowance of at least 10 sq. ft. per person in the canteen itself, with addition for kitchen space according to the type of catering to be provided. This may amount to as much as 50 per cent of the canteen floor space when full cooking facilities are provided for two- or three-course meals.

The room set aside for meals is the most usual welfare accommodation to be provided; even the minimum requirements in this direction earn the gratitude of workpeople, but benefits, which accrue from the provision of rather more than the minimum are amply repaid, especially in large works, due to better feeding and consequent reduction in lost time due to illness. The essential factors to be dealt with in providing a canteen are convenience of situation and attractiveness, in addition to good food at reasonable prices; even the latter is affected if the lay-out is bad and sufficient attention is not paid to upkeep expenses. The canteen must be clean, warm in winter and cool in summer, well ventilated and pleasantly decorated. Separate accommodation is generally provided for each sex, although it does not seem particularly necessary, since, if the canteen does not exist, both sexes are likely to use the same outside restaurants. It is general to work the dining-rooms on a self-service principle.

Site—It is an advantage if mess rooms can be approached from the factory under cover to avoid the necessity of putting on outdoor clothes in wet weather. If possible, the canteen should be fairly near the cloakrooms and lavatories, to avoid unnecessary duplication of movements and to ensure cleanliness of employees at meals. Since canteen rooms are often used for other purposes, such as games, a club, or for dances after working hours, it is wise to place the building near the street in order that employees need not enter the actual factory premises or grounds. Separate and direct access from the street is therefore wise and, in general, the entire welfare centre, whether in one or more buildings, is probably best placed near the main entrance to the factory.

Mess Rooms, etc—When mess rooms only are provided, and workers bring their own food, lockers for cutlery and crockery should be provided, in addition to the tables and chairs. Seats or benches should be avoided, but if used should have backs and be in short lengths. Waste-paper baskets or containers are essential. Tables should be about 2 ft 6 in wide and in short lengths for four or six persons at each. Table tops are sometimes of bare wood, which involves a considerable amount of daily cleaning, but are better if covered with some material, such as linoleum, bakelite, American cloth, or similar substances which can be easily cleaned or renewed and is not liable to damage by heat. When dining-rooms are divided for use by separate sexes or groups of workers, movable partitions are advisable in order that the whole room may be available for meetings, concerts and similar purposes. Good daylight is essential and ample windows should be provided, preferably in such a manner as to give good cross ventilation. Care should, however, be taken that the kitchen does not ventilate through the dining-room.

Dining-rooms, when full provision is made for cooking and serving meals not brought by the workers themselves, require an area of at least 10 sq. ft. per person, and preferably a little more. The kitchen, with necessary larders, stores, an office and staff cloakroom, require from 25 to 50 per cent of the area of the dining-room dependent on the extent to which the room will be used, whether for lunch only or for additional meals, such as tea and meals for shifts working beyond the normal factory hours. Figure 16 illustrates typical canteen lay-outs of different sizes and types. The essential plan factor in relating dining-rooms to kitchens is the provision of sufficient length of service counter and this generally means that the kitchen should be placed on the long side of the dining-room. The table spacing in factory canteens should be based on an allowance of at least 2 ft 3 in run of table per person, using tables about 2 ft 6 in wide; tables should be spaced at least 5 ft apart, with main gangways at least 4 ft wide, and preferably more, to allow for persons passing each other when carrying loaded trays. Rooms look more attractive if small tables seating four or six persons are used in preference to long tables seating many more, and such a lay-out appeals more to work-people, who probably like to be

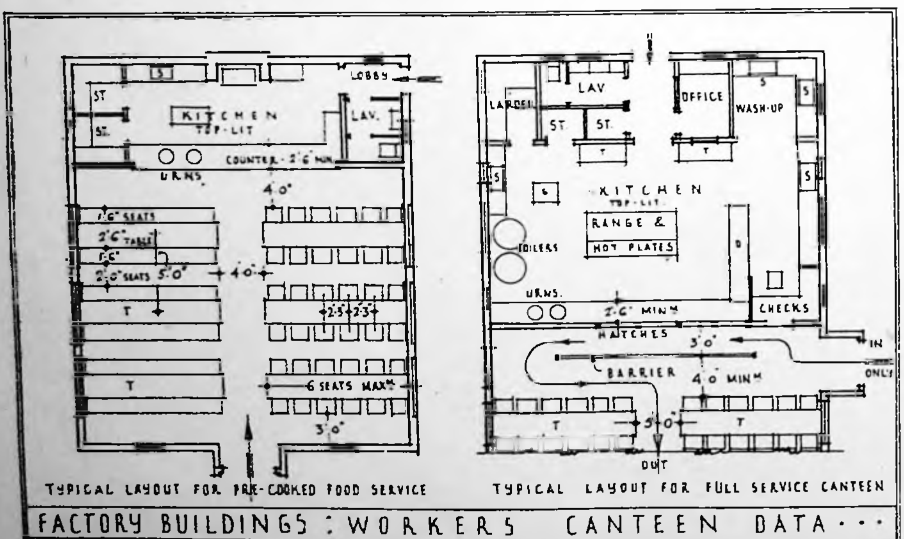
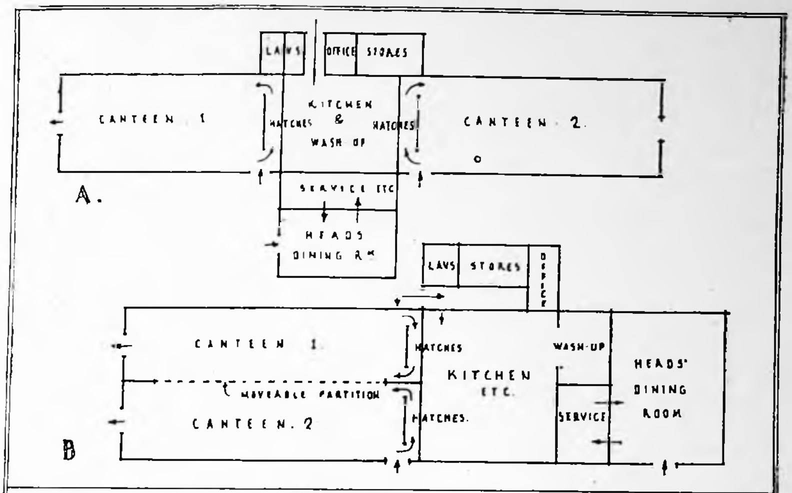


Figure 16

grouped with friends. Figure 17 illustrates two typical lay-outs where several rooms have to be served from the one kitchen. Type A has a main room for each sex on each side of the kitchen, and a small room approached through a servery for directors and heads of departments, for whom service by waitresses is needed. Type B has one main room divided by a movable screen or partition, both served from one side of the kitchen, which may have a servery if required. In each type direct goods approaches are provided to the kitchens, around which are placed the necessary subsidiary rooms, such as stores, larders, and canteen staff rooms. All entrances to dining-rooms should have draught lobbies as cut-offs. The general structure should be simple, but of good materials, chosen to reduce upkeep to the minimum. Floors are most pleasant if of wood blocks with linoleum or rubber matting in the main gangways.



FACTORY BUILDINGS : TYPICAL LAYOUT OF MULTIPLE CANTEENS

Figure 17

Kitchens—The extent and nature of the kitchen is dependent on the type of service proposed. When food is not being cooked in the kitchen, but only warmed up, much less space is necessary. The main equipment requirements are one or more hot closets or " steamers " for heating up meals, which are best placed near the service counter, so that meals are handled as little as possible between removal from the heater to the waiting workman; each worker's dish or container should have a numbered tally attached to it when handed in for identification. A plentiful supply of hot water is needed for making tea and coffee, or urns should be installed when demand justifies expense. A sink and ample draining boards and drying racks, with good hot and cold water supply and sufficient working space, are essential. It is fairly general, except in very small factories, to have one person in charge of the canteen or mess room, and to have charge of the building, its cleaning and to look after the heating of the food. A cool larder for storing food brought in by workers is required, in addition to a store-room. This type of kitchen is illustrated in Figure 16 A, which shows a typical layout. The counter divides the kitchen from the dining-room, across which the meals are served, and it is used for the urns, etc. It should be constructed in the form of a hatch, in order to cut off the two rooms as much as possible to assist ventilation and reduce the smells of cooking in the dining-room. The two stores shown serve as larder and general store, and on the opposite side of the kitchen are placed the back entrance and toilet facilities for the attendants. The range or steamers stand in a recess, with a ventilated hood over to remove steam and smells.

Kitchens which have to provide for cooking food instead of warming-up only need more elaborate equipment, which varies according to the numbers to be catered for, but there are certain necessities which are varied in size as necessary. A larder and general store opening into the kitchen, with suitable racks and shelves, a range, either gas, electric or coal-fired, one or more boilers and steamers, hot cupboards, hot plate, urns and preparation tables. The hot plates may form part of the service counter and the urns are also placed on the counter.

Direct access to the kitchen for goods is essential; also canteen staff cloakrooms and lavatories. A typical kitchen of this type is illustrated in Figure 16 B, which is based on serving a dining-room having about 120 seats. Dish-washing should be allocated to one part of the kitchen and placed so that attendants do not cross the circulation when bringing back dirty china from the tables. When full service is provided, some provision has to be made for payment by workers for meals, which may be provided in several ways. Some factories charge a flat rate per head for the whole meal, and others charge for each dish or course. Suitable facilities for such payment must be made. If a flat rate is charged, a cashier receives the money at the entrance to the room, or if individual charges are made, the cashier issues tickets, which are handed over the counter in return for the food received, or alternatively a cashier is placed at the exit end of a counter barrier and collects the charges according to the contents of each tray. When the cafeteria system is used the worker enters a corridor adjoining the service counter, separated from the main room by a barrier, and collects a tray, with knives, forks, spoons, etc., as necessary, and then places the tray on the tray rails or rests attached to the counter front pushes it along past the various food sections, selecting what is wanted and finally passing the cashier, who checks the food selected and makes the necessary charges. The counter is usually about 2 ft 6 in wide, and should be as long as possible. The service gangway between the tray rest and the dividing barrier should be about 3 ft wide in the clear.

First-aid and Medical Welfare—The medical department varies mainly according to the number of employees, and its size is dependent partly on the number of injuries anticipated and their potential severity and partly on whether such facilities as dental treatment are provided by the employers. There are three main sections of the medical department: treatment of injuries; medical consultation and care of employees' health, including eye and dental treatment; and physical examination of employees or intending future employees. Placing of the medical department is largely dependent on the first and last sections. If injuries are likely to be severe or numerous, it is advisable that the treatment rooms should be placed as near the workshops as convenient; but if the examination of large numbers of would-be employees is involved, the rooms should be placed near the entrance to the works, and near the employment department if one is provided. In all factories where women are employed, it is essential that a suitable rest room be provided, which should be under the care of a nurse (if the numbers of employees can justify the constant employment of such a person) and should be planned to form part of the medical department. These rest rooms should have toilet facilities attached and should be equipped with an adequate number of beds in proportion to female staff numbers. Although numbers do not often permit of a full-time doctor, there is considerable justification for the employment of a nurse, as a great deal of time is often lost through

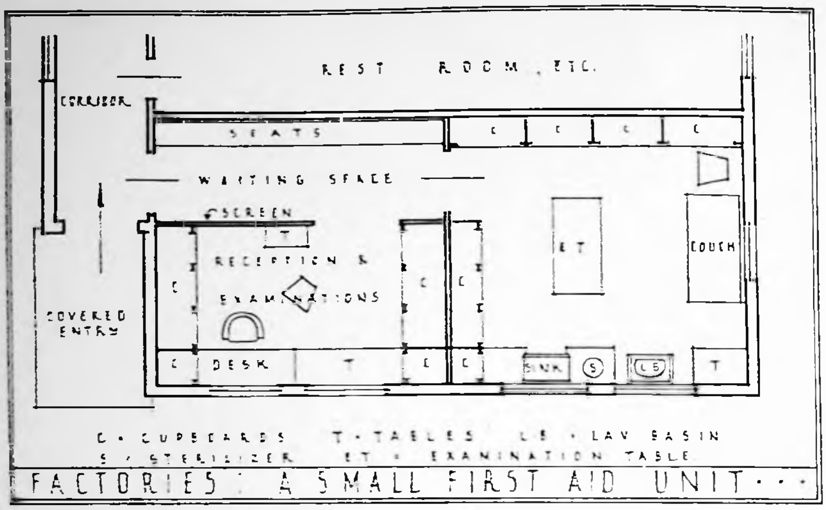


Figure 18

slight injuries becoming septic through not receiving proper attention immediately.

Care should be taken to separate injured employees from persons waiting for medical examination, which cannot always be done by asking intending employees to come at specified times when the works are normally closed or between shift changes ; two rooms should therefore be provided for waiting whenever possible. Even in small factories, where both sexes are employed, separate wards are necessary, but the one may also serve as the female rest room. Figure 18 shows a small first-aid unit comprising an examination room, which is also used as the nurses' office, and a first-aid room. The unit is placed adjoining the rest room, so that the nurse may control it. A small part of the examination room is screened off to form a waiting space, with fixed seating so placed as not to interrupt the clear passageway to the first-aid room and the carrying-in of stretchers. Larger units may need, in addition, small booths for undressing for physical examination purposes. The equipment of a small first-aid room need only be very simple : cases and cupboards are required for dressings, small equipment and blankets ; a sink, a lavatory basin and possibly a small steriliser, together with an examination table and a bed or couch, must also be provided. The examination room needs a desk and files for use of the nurse, and some seating. If the room is likely to be used for eye-testing, one clear distance of 20 ft. is desirable, although by the use of mirrors this can be dispensed with.

Larger medical departments require space for the following rooms : general waiting room, examination room with at least two dressing booths, one or more treatment rooms for dressing injuries, dental work, etc., two rest or recovery rooms, and an office for doctor or nurse. The rooms do not need to be large, except the waiting room where many employees may have to be examined. The dressing booths may be about 3 ft by 4 ft or 5 ft, curtained off from a main room. Beds in the rest rooms are usually 2 ft 6 in wide, and may be placed fairly close together. The equipment of the treatment rooms varies according as injuries are likely to be serious and other hospital facilities far away ; some firms consider that it is an economy to have good and sufficient equipment to meet all needs rather than to send employees for outside treatment. Rooms should be planned so that a stretcher may be taken easily from room to room, and doors should in consequence be at least 3 ft wide. The rooms generally must be well lighted and ventilated and should be pleasantly decorated, avoiding if possible the hospital atmosphere, especially in ordinary rest rooms. Figure 19 illustrates a large medical department for a factory employing workers of both sexes, but more particularly of one sex. The normal entrance for persons requiring examination is to a large waiting hall with lavatories for each sex attached ; this hall gives access to a dental treatment room and a rest room which might be used in connection with it, or alternatively as a women's rest room attached to the women's lavatory, as shown in the illustration. Opposite this is placed the general examination room, with dressing cubicles along one side, used by different sexes at specified times. Accident cases from the works arrive by a separate entrance, at which an ambulance may be loaded or unloaded under cover directly into a casualty reception or examination room. After preliminary examination the accident cases are taken either into the operating theatre, where further examination or dressing may be performed, or into one of the two wards. The two wards have a sink room and W.C. between, which they use jointly. Adjoining the theatre is a sterilising room and wash-up. A special point of the plan illustrated is the emergency first-aid store, which has external access ; this store is to provide essential materials for use at times (night or overtime shifts), when the main department may be closed. The office is so placed to control the examination room, waiting hall, and the accident entrance. Some exceptionally large works where many persons are employed now have very large and well-equipped medical departments with the following rooms

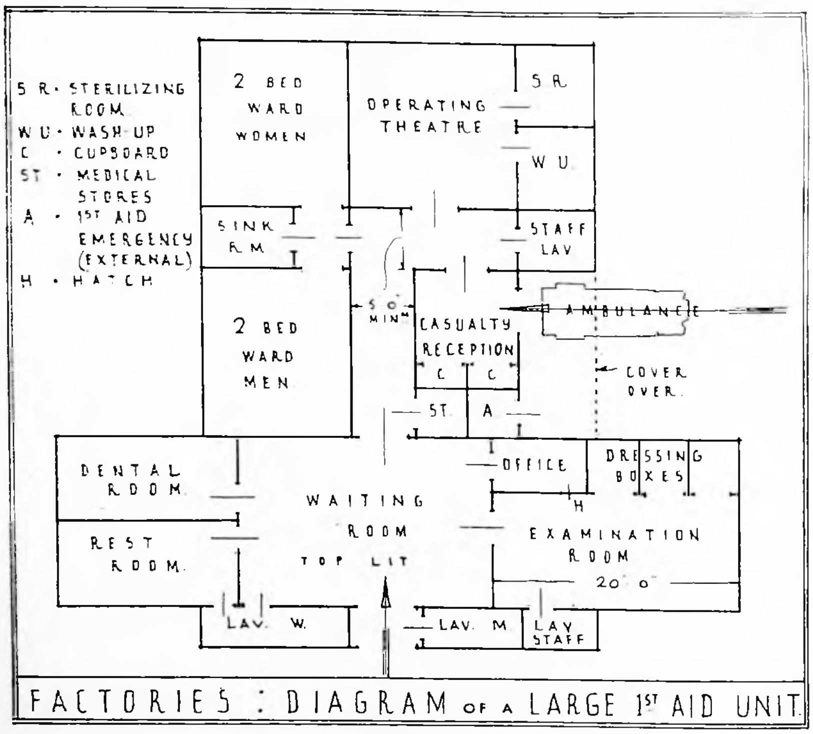


Figure 19

in addition to those already enumerated: X-ray, foot treatment, a dispensary for issuing medical requirements to workers, and a medical laboratory.

Further and more detailed information concerning the equipment of first-aid rooms, together with the essential dimensions is given in the section on "Hospitals."

Employment Office—In small works no special provision is made in the way of rooms or offices to deal with applicants for employment, but in most large plants it is now usual to set aside a number of rooms, frequently attached to the medical department, for the special purpose of carrying out interviews, proficiency tests and medical examinations. The medical examination rooms have already been discussed, as they are generally grouped with other rooms for medical services. The other rooms include one or sometimes (if both sexes are employed) two waiting rooms with toilet facilities adjoining; also one or two small interview rooms where full particulars of each applicant may be taken down in private and rooms in which proficiency tests may be carried out (though the interview rooms may be used for this purpose) for office workers on typewriters, calculating machines, etc. If unusual tests are needed, however, a room equipped as a small workshop is more satisfactory. The employment or staff manager usually has his room in this section, which also includes the time office and pay office, where employment cards, time sheets and complaints are dealt with.

Other Welfare Facilities — Many and various facilities for assisting employees are provided by some factory owners, such as classrooms for evening lessons or teaching young apprentices and workshops fitted up for use as a trade school; all these facilities have their own special planning requirements, but, as they are not very frequently provided, they are omitted from this section.

Many employers are prepared to spend considerable sums of money to provide welfare facilities for the use of their employees both during and after working hours, since it has been proved in so many instances that the industry benefits very considerably by the improved health of the employees, loss of time owing to sickness being avoided. Recreational facilities, such as the provision of sports grounds, together with the necessary pavilions, are subjects which have to some extent been discussed in other sections and have no special requirements resulting from their attachment to factories.

Power for the Factory—Power for use in factories may be represented by steam, gas or electricity together or separately. The first, if required, is generally provided by a boiler installation on the site, but gas is more usually purchased from outside supplies except in a few very large factories or where special processes are taking place. Electricity, however, may be produced at the works itself or may be purchased in bulk at high or low voltage from outside sources, mainly dependent on the anticipated quantity needed and the price at which it may be bought from outside suppliers. Grouped with the power plant should be the heating and ventilation of the factory buildings, which may be quite a small matter or, on the other hand, may need considerable space.

When outside sources of power are used, supplies will, in larger schemes, be supplied in bulk; gas in large diameter pipes and electricity at high voltages, each requiring the provision of a suitable meter room or house large enough to take transformers in the case of the latter. Meter and transformer houses are often placed near the point at which the main supplies enter the site; they must be separated from other buildings, roads and passageways by fire-resisting walls, doors, etc. If supplies are to be produced on the site, a power house is essential to accommodate boilers, gas retorts or dynamos, according to the power needed. The power house may be only a small boiler room in a basement in a small factory, but in some large schemes a very large building is involved both in regard to floor area and cubic content, together with the necessary fuel bunkers and cooling towers.

The placing of the power house in relation to the factory buildings is dependent on various factors, the merits of which must be weighed up in each scheme. These factors are the proximity to rail, road and river for the transport ot fuel supplies, the position in the building where the greatest consumption of power will be needed (this is of particular importance in the case of steam in order to reduce cost in supply mains, piping and insulation) and the proximity to an adequate water supply for cooling purposes if necessary; a further factor which may have some bearing on the position of the power house, if coal and coke are used, is the direction of the prevailing wind removing smoke and fumes.

Figure 20 illustrates diagrammatically the essential features of a large power plant in which steam is raised for serving electric turbo-generators, for process purposes and for heating the building. The main circulation shown consists of fuel supplies which pass to fuel storage from which the actual boiler furnace supplies are drawn as required, either by hand, by gravity feeding or by automatic stokers; the ashes are removed by travelling belts under the furnaces to an ash dump at the side of the building. The boilers which are raising steam at high pressure feed it directly to the factory for process work, to the turbines driving dynamos and to any necessary pumps. The steam after passing the turbines may be required at low pressure for heating the buildings and the hot-water system, either by steam or hot-water calorifiers. Cooling towers or continuous water supplies from rivers are brought to the side of the power house, and in the case of rivers the water is returned after use by separate drainage. The power generated is supplied to the factory either at the voltage generated or is transformed to suitable voltages.

Figures 21 and 22 show larger factory schemes where steam will be needed for the generation of electrical energy or for purposes of the manufacturing process itself and illustrate the main principles involved in placing the power unit in relation to the process buildings and fuel delivery. In smaller schemes where sources of heat other than gas or electricity are obtained from outside sources, the main requirements are similar but on a smaller scale. It is essential that fuel is used as near the

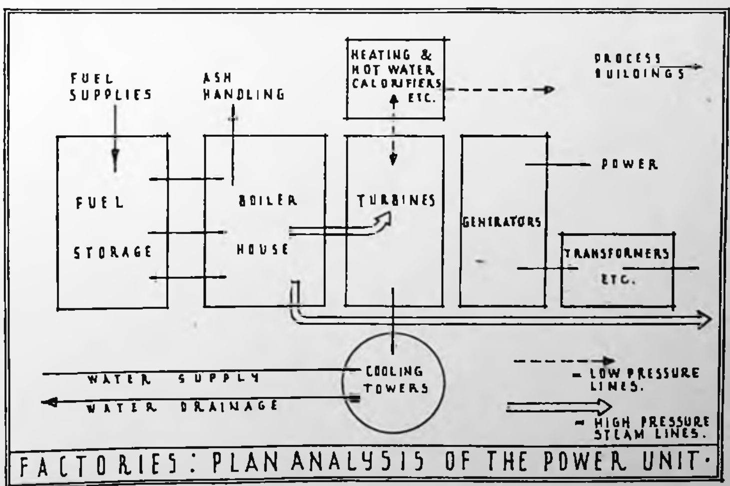


Figure 20

place of its arrival as possible, to avoid handling more than is absolutely necessary, even by means of conveyers, hoists and chutes, all of which are costly to operate and are liable to break down. In large schemes fuel is usually hoisted to elevated coal hoppers or bunkers which feed the furnaces by gravity, or they are stoked by power. Provision has also to be made for the removal of ash from both furnaces and site, the latter often being by methods similar to those used in delivering the fuel. Diagram A, Figure 21 shows the placing of the power house in relation to two process buildings, which are arranged one on each side of a railway siding also used in the reception of raw materials and possibly the dispatch of finished goods. Two or more railway tracks are required to leave at least one track clear for movement of trucks to process buildings and for removal of empty fuel wagons ; on the diagram the one track nearest the power house is used for full fuel wagons which are unloaded in turn by one of various methods into the bunkers. The power house is placed beyond the fuel bunkers, with the cooling towers, if any are needed, on the opposite side of the boilers to the fuel store. The ashes are removed from the side of the power house to trucks on a separate siding which does not interrupt the use of the tracks handling fuel and raw materials.

Diagram B Figure 21 illustrates a factory lay-out where fuel, raw material and finished products are partly delivered by railway and partly by water transport. The siding (which may need two or more tracks) passes the main entrances for raw materials and is carried on to the power house for delivery of fuel and removal of ashes if required ; the end portions of the tracks being duplicated, or increased in numbers as necessary, to shunt wagons to different tracks. The materials received from river traffic are lifted from ships or barges at the wharf and, in the case of fuel, carried by means of conveyers at a high level directly into bunkers, while goods are handled by other conveyers at the other end of the wharf. All fuel and power house supplies are therefore separated as much as possible from raw materials or finished goods going to and from process buildings.

Figure 22 shows a power house which has to supply a very extensive factory and a service of railway sidings adjoining a main line track not providing much space for the sidings owing to the size of the site. The power house is placed centrally along the range of process buildings and on the railway side, so that supplies of materials to the factory may be separated from the fuel deliveries. The main siding track is continued past the power house to the raw materials entrance of the factory and is subdivided to give standing space for several lines of wagons so that arrival and dispatch of goods may be dealt with at the same time. The diagram also shows provision for a fuel dump where fuel which is purchased at advantageous prices is kept in the open until required for use ; it is essential that such a dump is placed where it can be fed to the bunkers with the minimum effort, otherwise price-savings are quickly lost in extra handling costs.

Services and General Considerations—Heating, lighting, ventilation and other services are of the utmost importance in factory buildings to ensure the good health of employees and efficiency in the carrying out of all processes. The necessary installations have been discussed in this section only in so far as special planning requirements are concerned, as, for example, the provision of suitably placed window areas of dimensions adequate for each process ; other considerations being primarily of engineering or structural importance are considered to be outside the scope of planning and, in the main, can only be covered by saying that sufficient space must be provided to accommodate ducts, fans, conduits, belts, shafting, conveyers, etc. Much information regarding lighting is available in a pamphlet (Welfare Pamphlet No. 7, "Lighting in Factories and Workshops," H.M. Stationery Office, 1930, price 4d.), issued by the Home Office in the series of pamphlets dealing with Welfare and Factory Buildings. A further informative pamphlet is also issued from the same office dealing with ventilation (Welfare Pamphlet No. 5, "Ventilation of Factories and Workshops." H.M. Stationery Office, 1933, price 1s.). These and other pamphlets emphasise proper lighting, heating and ventilation, the former both in the form of daylight and artificial lighting. With regard to daylight, it is important that windows generally should be of the maximum dimensions and reach to the ceiling and be so placed that light cannot be obstructed in passing from windows to working surfaces. It is essential that working positions should be carefully planned in relation to light sources. Good artificial lighting must avoid both glare and strong shadows cast on the work itself, and must be adequate for the particular type of work under consideration. It may vary greatly

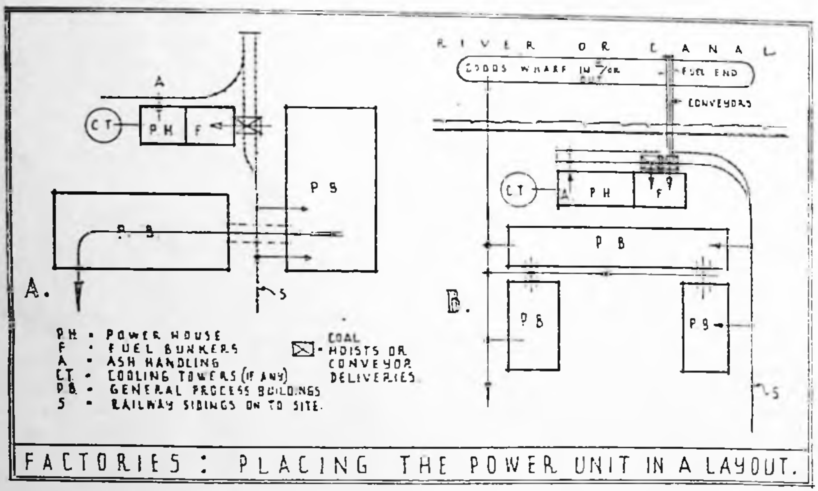


Figure 21

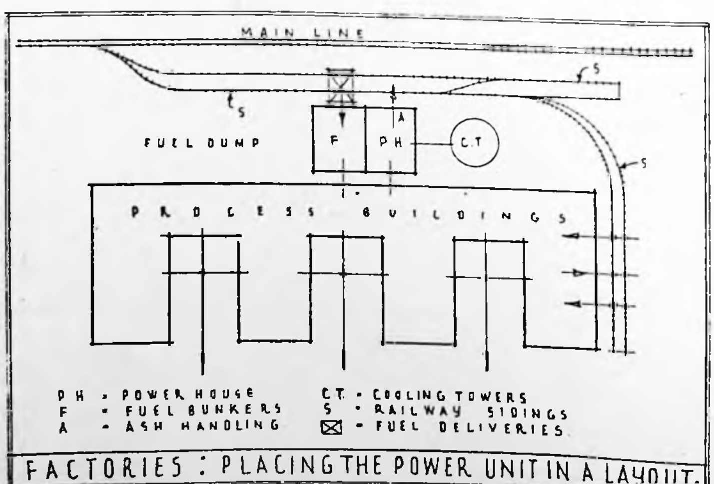


Figure 22

according to the material being worked upon and the amount of fine detail involved.

Heating and ventilation usually have to be considered together. Combined systems often prove the most satisfactory, while some processes demand very exact temperature or humidity. Then again, special requirements sometimes arise from the process or operation in each building. The law requires that all factory buildings must be provided with adequate ventilation and heating to ensure, as far as practicable, a pure, fresh and comfortable atmosphere.

Ventilation may be only a matter of providing sufficient areas of windows to open. These in the past have often been far too small; at least 5 sq. ft. per 100 sq. ft. of floor area should be allowed. On the other hand, ventilation may involve a complicated mechanical system to remove heat and fumes. Six air changes per hour should be assumed as a basis for normal circumstances, but in many works more frequent changes are essential. Temperatures to be provided depend very frequently on processes involved in the factory, but at least 60° F. should be maintained for workers under normal conditions. Humidity must be considered in relation and temperatures and may have to be carefully controlled in a number of manufacturing processes.

Silos—Many factories now employ silos of some description for the storage of raw materials, such as grain or nuts; in general the containers (or silos) are usually circular, especially when of large dimensions. The circular plan gives great strength at comparatively low cost, but a square or rectangular plan can be used when silos are smaller. Large circular silos are usually grouped together at the side of the process building in which the raw materials are first required and are filled from the top, feeding the ground floor or basement of the process building by gravity controlled by sliding shutters across hopper openings at the base of the silos. The silos are filled by means of some type of elevator, fitted with suitably shaped continuous running conveyers placed at one side of the silo or group of silos. The materials being lifted to the top "story" of the silos, the material is conveyed by fixed or movable chutes to the mouths of each container, as shown in Figure 23. The smaller spaces formed between four large circular silos may also be used for storage of materials as desired. Smaller silos, which may be square or circular in shape, may be accommodated on upper floors of buildings in the same way as water tanks. Raw materials may thus be fed to upper floors of a multi-storied process building. This method is, however, not possible with large silos as the latter must stand on the ground and the contents must be lifted again for use in multi-story factories.

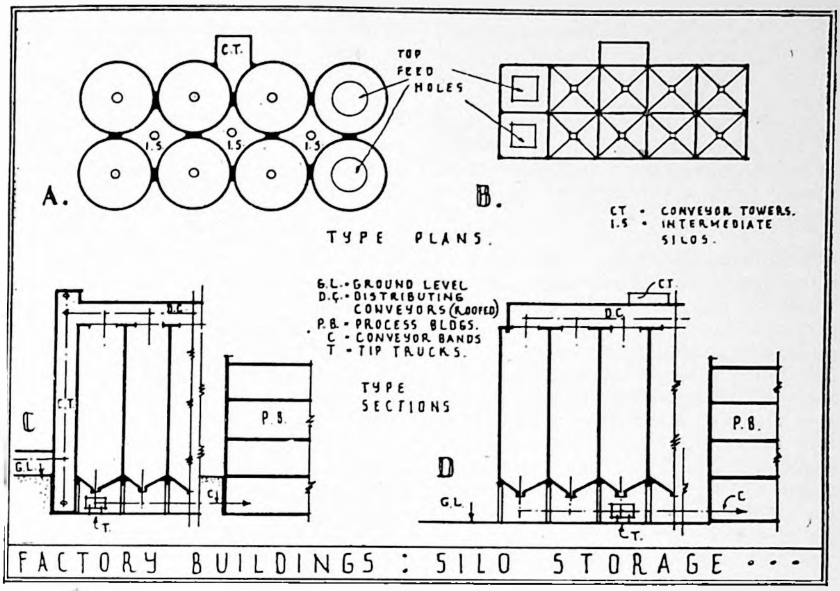


Figure 23

Figure 23 illustrates two type plans showing the grouping of circular silos (A) and of square silos (B), together with conveyers for hoisting the materials to be stored. The figure also shows two typical sections through silos stressing the relationship of the bottom outlets to the ground level and the process building. In Diagram C, the outlets, being at about ground level, necessitate excavating below ground level for the conveyers to feed the factory, which also has to have some part at basement level to receive the contents of the silos, even if they have to be lifted to the top floor level for commencement of the process. This type of section becomes advantageous when it is necessary to excavate the ground owing to its lack of supporting strength for the structure over and the length of the conveyers in the elevator tower is reduced. The machinery for the conveyers is generally at the bottom of the conveyer tower, which is therefore below ground level in this example.

The section in Diagram D shows the silos raised above ground level on supports so that the hoppers are raised high enough above ground level to feed into the ground floor of the building by gravity, chutes, or trucks. Sufficient height must be provided in each case at the top of the silos to house the distribution conveyers which pass the materials from the hoisting conveyer to the mouths of the silos. Large silos are generally constructed of reinforced concrete, but smaller ones are sometimes constructed of metal.

Warehouses—Warehouses or store buildings are required in conjunction with many factory buildings, especially for the storage and packing of finished articles. Frequently they do not require much window area as light is not needed, and is in some instances definitely undesirable. Floor heights need not be more than 7 ft 6 in, or 8 ft for efficiency, as articles stored at greater heights are out of normal reach. In many warehouses heavy loads have to be dealt with, requiring thick floors and large supports, the latter having to be carefully arranged not to interfere with the best lay-out of storage spaces. In some processes packing takes place before storage, either in whole or in part, but in many others the packing is not required until the moment of dispatch; thus, time of packing in relation to process of manufacture has much influence on the position of packing space in relation to storage.

Figure 24 illustrates (Diagrams A and B) two plans of warehouses where, after storage, packing takes place immediately prior to dispatch from the warehouse. Type A, together with section C, shows the whole of the ground-floor area devoted to packing and dispatch, the latter being by means of road vehicles only; while Type B, with section D, shows a similar lay-out, dispatch in this case being partly by road on one side and partly by rail on the other side of the warehouse. In Type A, hoists or lifts bring the goods from upper floors to ground floor in such a position that goods which need packing are taken to one side to be dealt with while others are loaded directly into lorries or stacked on the loading platform. Section C shows the first-floor level placed in relation to the ground level to provide clear height of 16 ft for lorries, but the ground-floor level is placed at loading-dock height, namely, about 3 ft above road level. Type B has the hoists placed to each side so that a clear space for loading is left between railway dock and lorry-loading dock. Packing space is provided round each pair of hoists. It is generally advantageous to place hoists or lifts in pairs. This saves

waiting and the consequent loss of time, and prevents disorganisation due to temporary breakdowns. It should be noted that in most schemes railway trucks cannot easily be brought inside the building but must be loaded, as shown, from a platform along the side of the warehouse. This should have a cantilevered roof as a protection.

Laboratories—Many factories require research and/or testing laboratories for the use of the staffs. The accommodation may involve one small and very simply fitted room, a large department, or even a separate building. Neither the size nor equipment is in any way standardised, and therefore presents far too many problems to be considered fully in this section.

From the factory point of view the main points affecting planning are as follows. The laboratory should be placed in a suitable position in relation to any part of the factory which has to be referred to constantly by those working in the laboratories. The accommodation, however large or small, should be well lighted and ventilated and, if possible, have a northern aspect, quietness, freedom from vibration and be so placed that any services, such as heat, electricity, gas, steam, compressed air, etc., may be easily provided. Laboratories for research are very frequently grouped with the office accommodation, and may be placed advantageously on upper floors of office buildings ; insulation against vibration from any adjoining process must be provided. An experimental workshop, if needed, is frequently placed in very close proximity to the research workers, as these two sections generally have to work in close combination with each other. Process testing laboratories may have to be distributed in one or more places in the process building, positions being dependent on relationship to the actual work of the factory ; frequently these are only small areas divided off from the manufacturing process by screens or division walls.

Offices — The amount of office accommodation required at a factory varies considerably ; sometimes offices for the sales staff are at the factory, whereas in other schemes these, together with all general management, are separated and placed some distance away. All factories, however, need a small amount of clerical staff, together with private offices for the works manager and other important members of the staff. This accommodation, if small, usually occupies a minor part of the ground-floor area of the factory nearest the main entrance, and when large should have either a small separate building or some part of a building near the works entrance. Space on a first floor or mezzanine is often used for offices in single-story works or process buildings. The works manager should always be allotted accommodation where he has easy access to all parts of the factory. Offices for foremen, etc., have to be provided in the shops themselves, but usually consist merely of areas of floor space on the production floors in each shop, simply screened off, very frequently by glazed partitions. These small offices are often placed against internal walls or in the central parts of floor space, as daylight is more valuable for machine and process work and the foreman only occupies the office at intervals during the working day. If there is a fairly large office block of several floors attached to a factory, the most satisfactory placing of groups of offices appears to be : offices dealing with works matters, such as employment, pay and works manager, on the ground floor ; general management and sales offices on the first floor, and laboratories, research rooms, records, drawing offices, etc., on the upper floors. (See also section : "Office Buildings.")

The Entrance—The planning of the entrance to a factory group is of the utmost importance to ensure efficiency of working. Ample space must be allowed for a number of persons to enter in a short time, deposit clothes, house bicycles and clock in, with the minimum of congestion and loss of time. Equally, transport entering and leaving the site has to be controlled and directed and must not interfere with employees' entrances. It is wise to set back boundary walls or fences at the entrances to give space for the pedestrians to pause before, or after, leaving the factory premises and also to improve angles of vision of lorry drivers leaving the vehicular entrance, as shown in Figure 25. The figure also illustrates clearly the separation of vehicles and pedestrians as they enter the site by different gateways placed on either hand of the control building or gatehouse.

The employees or visitors must pass the control building, where visitors may make inquiries and employees clock-in before passing to the welfare building or cloakrooms. A cycle shed should be so placed that employees may leave machines before passing the time clocks, which are grouped at the gatehouse and placed under cover. Vehicular traffic should enter the site separately and pass over the weigh-bridge which is controlled from the gatehouse, before proceeding to the factory buildings. Provision should be made, and be under the supervision of the gatehouse, for car and lorry parking before passing the weigh-bridge. Traffic, should, after leaving the factory building, repass the weigh-bridge and gatehouse before leaving the site. At the entrance to the factory is often placed the meter-house in which are assembled the various meter-rooms, one for each service, separated from one another by incombustible materials, although all meters can advantageously be grouped together under one roof.

Figure 26 illustrates in greater detail a typical gatehouse building which controls everything entering or leaving the site. The accommodation provides covered space for employees waiting turns at the time-recording clocks, which are placed in

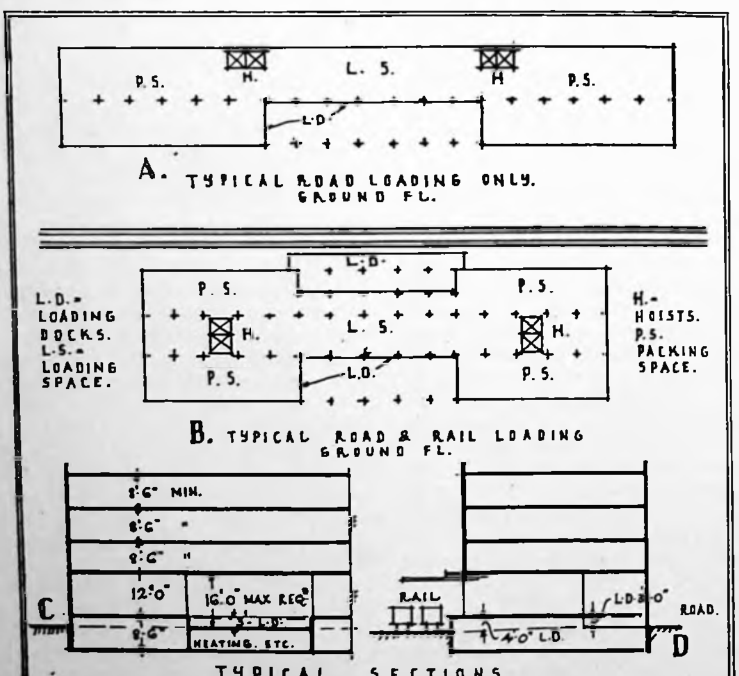


Figure 24

two groups, a waiting room for visitors and a small interview room where foremen or members of the management may interview visitors without the latter entering the factory buildings or offices. There is also a general office in which accommodation is provided for the machinery part of the weigh-bridge, and checker's desk, also table space, desks and files for dealing with records from time-recording clocks, visitors, deliveries and dispatches. This general office has a bay-window giving a clear view of the approaches to the weigh-bridge, both from the main road and from the factory buildings. In this bay-window should be a hatch through which way-bills, etc., can be handed

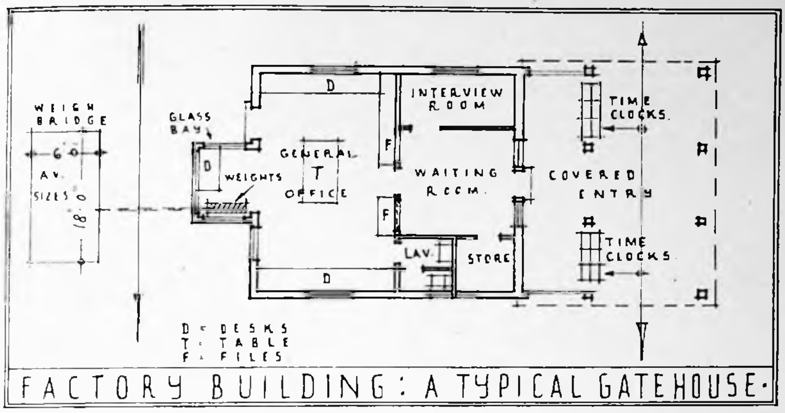


Figure 26

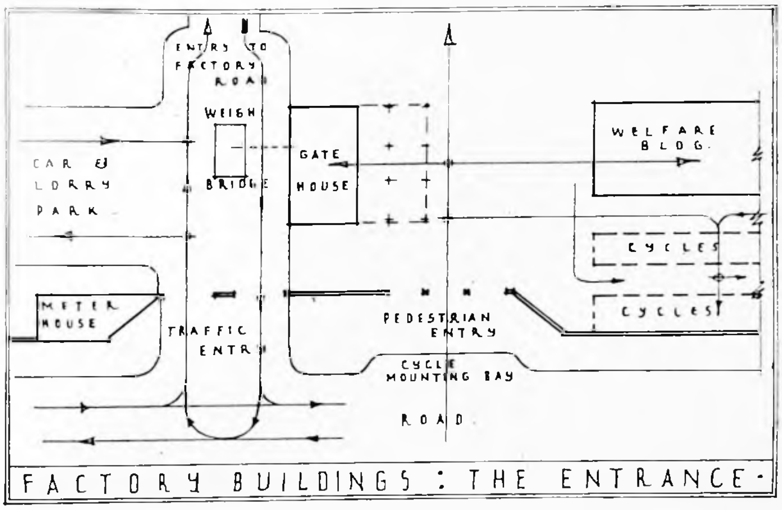


Figure 25

in and out, but, in addition, a door from the office to the weigh-bridge is required.

The remainder of the accommodation shown on this figure includes a lavatory for the office staff and a small store for time sheets and stationery. The weigh-bridge should be so placed that all vehicles may use it in either direction, if required, but also that vehicles can pass it on either side on the main traffic lines when its use is not required. Weigh-bridges are sunk into the roadway, so as to be level with the normal carriageway, the mechanical apparatus being controlled by underground mechanism from the gatehouse. The size of apparatus is controlled by anticipated loads and vehicle sizes, but average dimensions are 6 ft wide and 18 ft long.

Cycle Sheds—Information concerning the storage of bicycles has already been given in the section on " Schools." Cycle sheds should always be placed near the entrance, if possible, and to one side of the main circulation.

Parking Space—Some parking space is required adjoining factory buildings and should be placed where it can be overlooked by the gatehouse or door-keeper. The parking space for visitors should be separated from any space set aside for cars belonging to members of the staff.

NOTES

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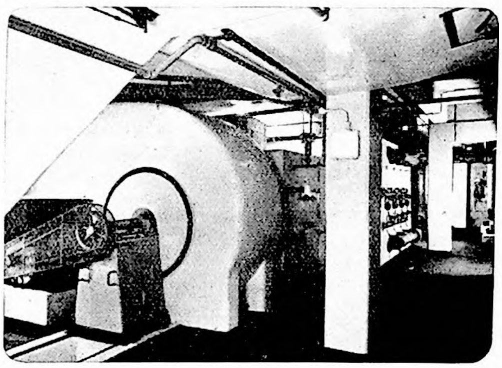

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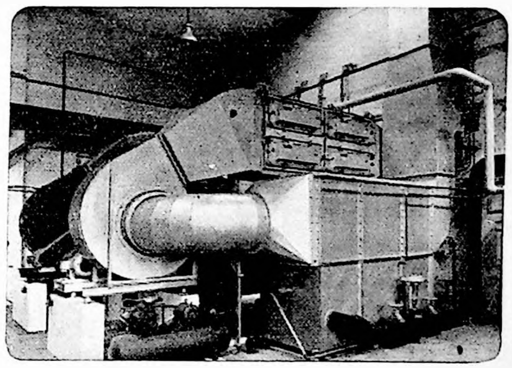

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9. *Office Buildings*

Introduction — This section is devoted to the planning of those buildings primarily designed as offices to be used either by one firm or to be leased to a number of separate tenants; parts of the buildings, particularly the ground floors, are often leased for other purposes such as shops. It is proposed to consider buildings for both urban sites and for country sites where the offices may form part of a factory scheme.

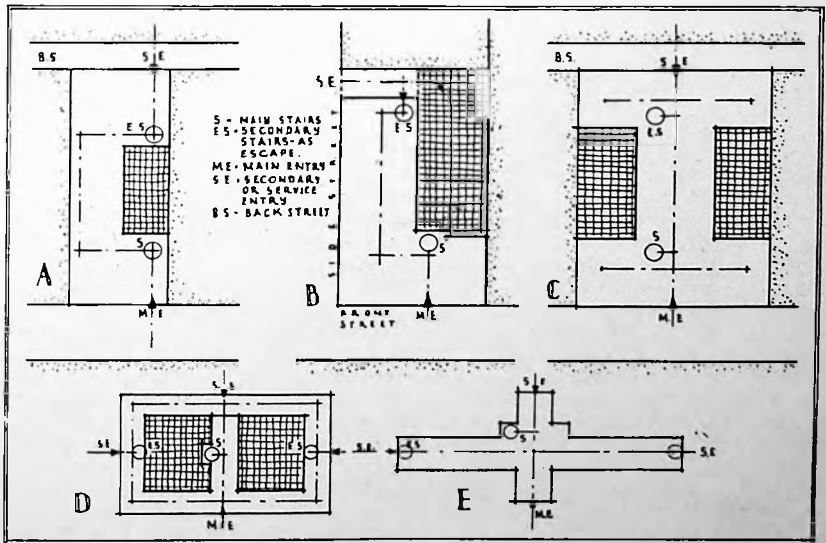
Sites—The architect seldom has much influence in the purchasing of sites for offices, especially in town areas, but is usually called in to make the most advantageous design for a site already bought by a firm for its own use or for development as a financial proposition. The aspect of sites for offices is of little importance except when open country sites are under consideration, when advantages of sunshine should be used for important rooms and specially suitable aspects should be selected for rooms for special purposes such as laboratories and drawing offices. Country or very open sites do not present more than normal planning problems which call for few comments; adequate circulations, both horizontal and vertical, are important, together with sufficient light for all rooms and proper lighting and ventilation for corridors. Congested urban sites, however, may have many planning problems; except on very large open sites street frontage lines are generally built up as illustrated on Figure 1, Diagrams A, B, C and D. On the large sites alternative plan types may be adopted according to circumstances, either based on the whole or part of Figure 1 D, which has central areas or light wells, and the building placed round the perimeter of the site, or, as shown on Figure 1 E, where the building is composed of a number of wings radiating from a centralised vertical circulation which eliminates internal light wells and frequently improves letting values, as the light and air in the offices tends to be better than in enclosed areas, unless the latter are exceptionally large or have strong bearing on the economical development of a given site area.

Figure 1, Diagram A, illustrates a site with a narrow frontage to each of two streets, one more important than the other, which has a direct influence on the planning of the main vertical circulations. Such a site can only be developed by having a block of buildings equal to the width of two offices with a corridor between placed on each frontage with a connecting link made up of one office width and a corridor width which obtains its light from an internal area or light well; the size of the latter is governed by building regulations or reasonable light requirements, which generally control the necessary angle of light to the lowest windows overlooking the light-court. Secondary access is most important and sites should be chosen wherever possible with two street frontages; these secondary entrances are not only needed for deliveries and services but also to act as secondary means of escape to conform to fire escape requirements. When a second street frontage is not available it may be necessary to have a secondary entrance (and escape) on the main frontage, but this should be treated in such a manner that there may be no confusion as to which is the main entrance. It should be remembered that in some schemes the areas shown will not, or need not, go to the lowest floors, particularly in the case where shops or showrooms are provided on the ground floor and basement levels.

It is becoming increasingly necessary to consider vehicular access on the site, apart from the parking of vehicles, for all deliveries of goods to the building and the offices in it, especially in view of the L.C.C. regulations (1937) regarding loading and unloading of vehicles being made within the site: it seems very probable that these regulations may be extended to other districts where deliveries to buildings and street congestion are as bad as in the most crowded parts of the L.C.C. area. If regulations requiring all deliveries to be made within the area of sites extend, sites with small frontages will have to devote a large part of the ground-floor site area to these purposes; this will have a great influence on the planning of main and secondary entrances, particularly on sites with one street frontage only; some 10 ft will be needed for a vehicular entrance to the site.

The type of plan adopted in Diagram A requires a frontage of about 36 ft to provide an area of reasonable width for a building having several stories, on the assumption that an office and corridor require with enclosing walls about 26 ft, as will be discussed in detail later.

Diagram B, Figure 1, illustrates a corner site having one frontage to a main street in which the main entrance is placed and the other frontage to a side street which provides for a secondary entrance and access to a service area or yard as may be necessary. This type of plan can be used for a site having about 60 ft minimum width to the main street, although a slightly greater frontage of about 70 ft would be much more satisfactory. The width of the building on both frontages is based on the use of a central corridor with offices on each side. Vertical circulation is very straightforward in this type of plan as the main staircase and lifts are placed in the block on the main frontage with a



OFFICE BUILDINGS : THE SITE & GENERAL LAY-OUT·

Figure 1

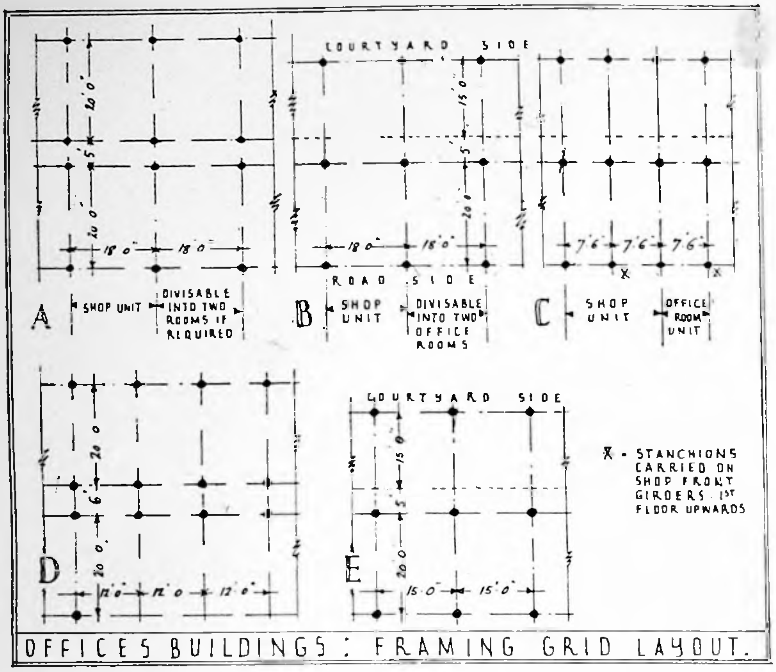


Figure 2

secondary staircase at the opposite end of the site delivering into the side street at the service entrance.

The type of plan shown in Diagram C is in many respects similar to that in Type A ; there is a main street frontage and a frontage to a secondary street ; the remaining two boundaries have property adjoining. The most economical development of such a site is by using double width blocks with central corridors on both frontages and as a connection spine, the rooms in the connecting unit being lighted from wells adjoining the site boundaries. The minimum site width for a plan of this type is about 80 ft, unless the building has many floors when the light wells may need to be increased in width. The placing of staircases to serve for circulation and escape depend somewhat on the length of the wing of the blocks on the street frontages and whether the space occupying these wings is used as large open offices or as a number of small rooms. If the wings are short or occupied by large offices, the staircases may be placed as shown in the diagram, but if they are long or are divided into many small offices, additional staircases at the ends of the wings may become necessary to provide adequate means of escape in case of fire. This placing of staircases also arises in plans of the type shown in Diagram E ; the long wings to the left and right of the central block will need staircases near the ends, but the short wings adjoining the central block can probably be served by a single main staircase as shown, and extra staircases would only be needed if the short wings are considerably lengthened. The plan shown in Diagram D can usually be handled with a central staircase and secondary escape staircase in each of the other two main blocks, but if the distance to any staircase is more than about 80 ft from an office door, additional staircases may be needed. The additional staircases in larger buildings serve not only for escape purposes but also aid general circulation, as the amount of walking between one office and another may become very great if the main staircase or lifts have to be used for each journey. It is important, however, that all rooms are available from the main entrance as well as from secondary entrances, especially in buildings leased in small units as lettable offices.

Framing Grid—Planning of all multi-storied office buildings depends on the basic grid lay-out adopted for the framing of the building whether the construction has brick or stone piers or steel or concrete framing. The units are based on the most economical development of each individual site and to some extent on whether the lower floors are to be used as offices or for other purposes such as shops or showrooms. If shops are to be planned on the ground floor the type adopted has considerable bearing on the most desirable unit of frontage needed ; some districts may require shops based on units of about 18 ft frontage which can be let as one shop or if necessary may be sub-divided into two units of 9 ft each, which is about as small as is desirable. If shops of other sizes such as 10 to 14 ft frontage are to be accommodated, the upper floors to be used as offices should be based on a grid lay-out of the same dimensions. Twenty feet should be considered as the maximum bay unit of frontage but this is likely to be far less economical than bay sizes of 12 to 15 ft span. These bays are partially dependent for economy of construction on the length of the span from the supports on the frontage to the next intermediate row of supports as the two dimensions of the floor jointly control its thickness. Large spans necessitate deeper beams which have considerable influence on the floor to floor heights which, when totalled together, are controlled by local building regulations ; very deep beams require greater height floor to floor of the office floors with the possible loss of a story in a given or fixed overall height.

Figure 2 illustrates five typical examples of grid spacing. Type A illustrates an 18 ft wide frontage spacing suitable for large shops on the ground floor with offices over which can be sub-divided, if the windows are suitably spaced, into two small offices in each bay which allows, after deducting partitions, rooms about 8 ft 6 in wide, which is sufficient for small offices. The spacing of the supports across the block is based on duplicating the piers or stanchions on each side of a central corridor ; the depth of the offices on both sides of the corridor is based on a span of 20 ft and the width of the corridor as 5 ft. Except with very large windows (which cannot exceed, in the London County Council area, 50 per cent of the wall area) or on very open sites, greater depths from window walls than 20 ft are of little value as the daylight is very poor. There are many examples of offices having greater depths than 20 ft, but of very few can it be said that the daylight is adequate, taking into account the average weather and sun strength of this country. A spacing of supports as illustrated in Figure 2, Diagrams B, C, and E shows a special consideration for offices overlooking courtyards, either fully or partly enclosed ; unless the courtyards or light wells are of unusual width and the walls treated to reflect the maximum amount of light the offices cannot be considered as having equal advantages as those having windows on external frontages. These three diagrams are based on the provision of maximum depths of rooms from the courtyard window wall of 15 ft instead of 20 ft as suggested for rooms with windows on to main frontages. These reduced room depths are also desirable for rooms on external frontages when windows overlook very narrow streets, as frequently is the case on sites in congested city districts. To obtain this reduced bay depth it is often economical to space the intermediate supports on one side of the corridor thus having the supports placed centrally in the block and deducting the necessary corridor from the courtyard side as clearly shown in Figure 2, Diagrams B, C and E.

Diagrams A, B and C are all con-

trolled by the provision of shops on the ground floor ; Types A and B are based on 18 ft units of frontage, but Type C is based on units of 15 ft on the ground floor for shop purposes, and divided above each with supports picked up over the shop fronts giving 7 ft 6 in wide office units which is as small as is useful for any purpose. The grid principle should be maintained carefully throughout a plan especially for lettable offices in which the ultimate spacing and divisions of the office spaces is unknown, and consequently all partitions are movable but must be capable of economical arrangement in a variety of ways to suit individual firms' own office staff requirements.

Diagrams D and E are based on the assumption that shops will not be required or that units of 12 to 15 ft can be adopted for any ground-floor lettings other than offices. The types of grid which give very small room units (7 ft 6 in to 9 ft centres) are suitable for many purposes, but generally it seems that larger units are better since the resultant room shapes are more readily adapted to furniture lay-out.

Height Limitations—Figure 3 illustrates two typical sections based on plans shown on Diagrams B and A of Figure 2. These sections are drawn in conformity with London County Council regulations which limit the vertical wall height in the widest streets to 80 ft from the pavement and allow two additional stories either set back or constructed in the roof within an angle of 75 degrees with an overall maximum height of 100 ft above the pavement. It should be noted that the number of stories in each diagram is different ; Diagram A has 10 floors including the ground floor, and Diagram B only 9 floors ; all floors have been made the same height floor to floor in each diagram. A height of 10 ft from floor to floor is about the minimum that should be used to provide proper headroom under beams and adequate lighting in the offices, more particularly on the lower floors in congested districts. The advantages of each type of section are, first, in Type A the extra story in the allotted overall height provides greatly increased lettable or usable floor space, but bearing in mind the average angle of the sun in districts as far south as London as shown on the figure, the floor area receiving direct sunshine is much less than in Diagram B where the floor heights are greater. The greater height in the rooms permits of increased spans while still maintaining an equal amount of sunlight which probably offsets the advantage of floor space gained by the extra story of Type A.

Type A shows a section based on the placing of a single row of intermediate supports in the centre of the total overall width of the building and the corridor (if any) width deducted from the rooms on the courtyard frontage. Diagram B has a double row of intermediate supports on each side of a central corridor. These two sections also illustrate the two main alternative methods of setting back above the 8 ft high parapet level. On the left-hand side of each section the walls of each of the two top stories are set back, thus maintaining vertical external walls, while the right-hand sides show sloping roofs with dormer windows. The merits of these two alternatives are difficult to assess ; the dormer window type gives extra floor space, but as this is partially covered by sloping ceiling it is not of full value. The vertical walls are probably easier to maintain, but may be somewhat troublesome from a constructional point of view as they involve point loads set back from the main supports.

Office buildings are controlled by local building regulations, which may

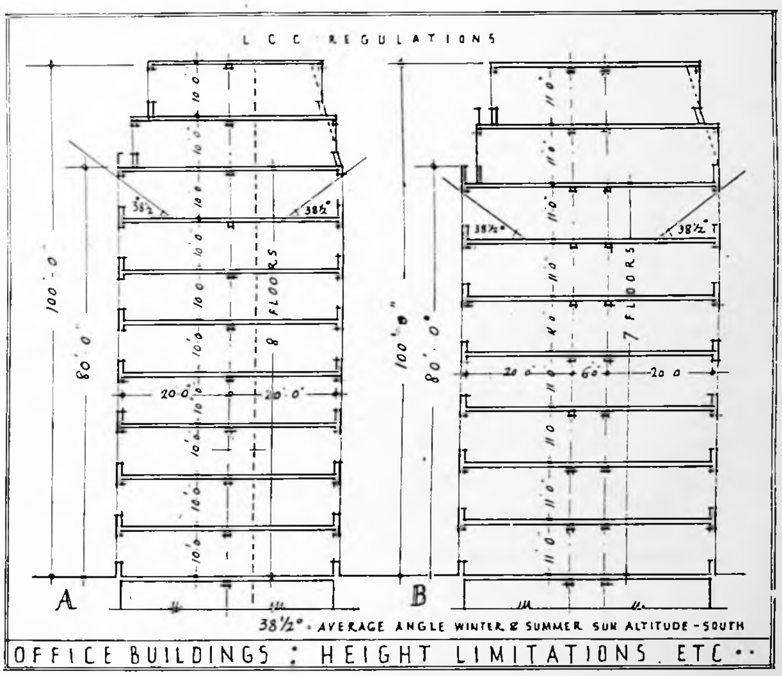


Figure 3

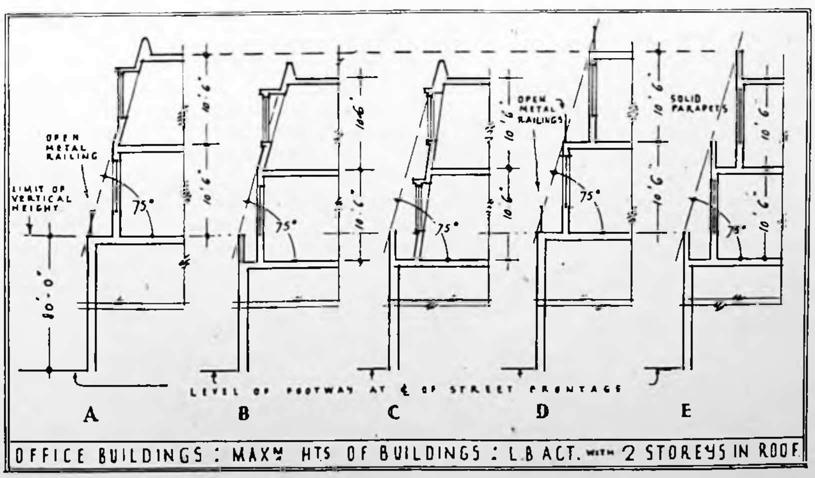


Figure 4

govern heights and any setting back of stories that may be required. For example, Figure 4 illustrates the effect of the L.C.C. regulations which limit the vertical height of the external wall to 80 ft from the pavement, measured at the centre of the frontage, or to less height, according to the width of the street on to which the building abuts. Buildings on corner sites are regulated for a distance of 40 ft on the return frontage by the height permitted on the main frontage. In addition to the vertical height of 80 ft two stories may be erected in the roof, but must be contained within an angle of 75 deg. as shown on Figure 4, although special architectural features may be allowed outside this angle. These upper stories may, as previously stated, either be in the form of pitched roof or of set back vertical

walls. It should be noted carefully that dormer windows, open metal railings being architectural features, are not controlled by the Act and need not be placed within the prescribed angle ; nor is the maximum length of the dormer windows laid down and they may therefore extend along the greater part of the frontage. The figure shows the variations in the amount of available floor space in each type due to either the pitched roof or the set back walls.

Entrances—The size, placing and type of entrance is very dependent on whether offices occupy the whole building, whether there are shops or showrooms on lower floors, or whether the building is mainly or entirely occupied by one firm. In those buildings devoted entirely to one firm the entrance should be in a prominent position and is generally of more ample size than in lettable offices, or in cases where the entrance has to be arranged among a series of shops. The main entrance should usually be from the most important street if the building has several frontages, even at the expense of lost shop frontage ; a main entrance in the important street adds to rental values and also assists strangers visiting the building to find the entrance quickly and easily. Except in small suites of offices, each let separately and placed over shops, the entrance should provide space for a lift, main staircase, porter's box and often in addition notice boards, a letter chute and a staircase to basement, where communal services such as heating are to be controlled by the porters. One entrance only to lettable offices is sufficient (although, of course, there will be service entrances or escape exits in addition), unless the building is very large or there are special conditions—such as one firm occupying a part of the building and letting off the remainder—which necessitate two entrances, one for the firm and the other for the lettable offices. The reduction of the number of entrances economises cost of porters and lift attendants, and generally assists proper supervision of all persons entering and leaving the building. Access to floors placed over shops has already been discussed to some extent in the section "Shops and Stores," but when such upper floors are to be let as offices apart from the shops, as opposed to flats for the shopkeepers or as offices in connection with the shops, entrances should be placed in positions which may be seen easily and should not be inside shop frontage lines or behind display windows. Except in large blocks of offices, where the offices are as important as the shops, office entrances have to be reduced to minimum sizes in order not to occupy valuable shop space ; when the first floor level is reached an entrance hall can be formed if needed. One entrance of this type should be sufficient to provide for offices over at least two shops, thus reducing the loss of shop frontage to a minimum ; by the use of corridors the whole space over a block of shops may be served by one entrance. It often happens, however, that when a building in a street is demolished and rebuilt with one or perhaps two shops on the ground floor, the upper floors are not required for purposes connected with the shops and therefore become available for lettable offices ; these offices have to be approached by a staircase and very small entrance occupying a part of the frontage. In such examples staircases should not be less than 3 ft wide in the clear, and the space at the entrance door on the street level should be large enough for two persons to stand comfortably while the door is being opened, that is to say there should be about 6 ft from the door frame to the first riser face of the staircase. Space permitting, it is always desirable to have two doors at the entrance, the outer one for night use and the inner one (preferably glazed) for daytime purposes to provide light at the entrance and to eliminate draughts on the staircase ; offices in buildings of this type do not as a rule have more than two floors, mostly let in one occupation and are not equipped with lifts.

Figure 5 illustrates a typical entrance to a building used entirely for office purposes. The entrance is in the centre of two wings with a connection on the central axis to a similar block at right angles to the main frontage. The essential circulations are fixed by the central corridors in each of three blocks which should be maintained on all floors without interruption by lifts or staircases. The main entrance corridor from the street to the lifts and staircase should have a width of at least 8 ft, and in large buildings this width should be considerably increased ; for normal eight- or ten-storied blocks of this type, 12 ft should be considered as a minimum main entrance vestibule width, since the number of persons is large at certain times. It should be noted that the entrance doors are duplicated to form a draught lobby and outer doors are set back from the frontage in order to provide the necessary steps from pavement to ground-floor level without obstructing the footway. The staircase commences in a position in which the first steps are easily seen on entering the building while the battery of lifts is placed on the opposite side of the same widened waiting space ; some such widening is desirable in front of all lifts and staircases to avoid congestion. The planning of staircases and lifts must always be considered in relation to the upper floor corridor lay-out, so that there is repetition on each floor of the staircase hall and corridor approaches. The shape of the light well should be noticed, as it is desirable that some daylight should be available on the main staircase and in some administrative areas this is an essential requirement under the by-laws.

The planning of entrance halls is largely controlled by the circulation lay-out of the typical upper floor plan and for this reason both lifts and staircases should be placed so that circulations on upper floors are not interrupted and are properly related to the corridors in order not to waste useful office floor space. Staircases and lifts should be grouped together whenever possible and should be planned to be as obvious as the main horizontal circulations will permit.

Figures 6 and 7 illustrate two typical office entrance halls and the relationship of the planning of the lifts and

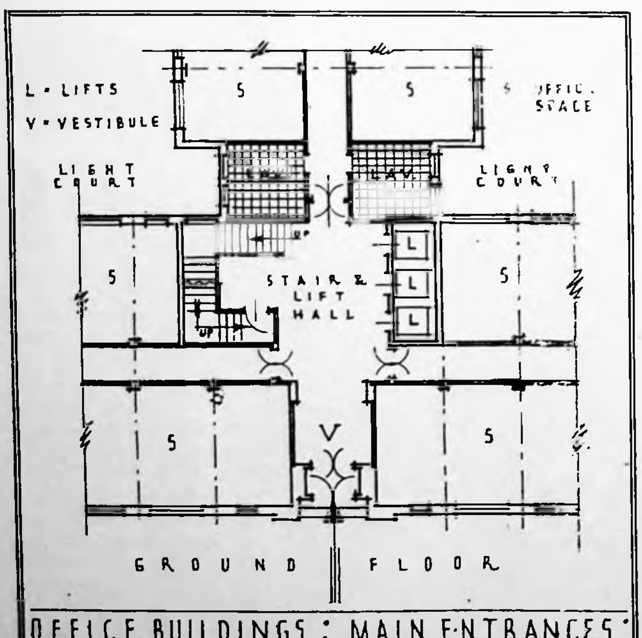


Figure 5

staircases to the corridors at upper floor levels. Each example shows shops on the ground floor, but this could be office space if needed. Figure 6 has an entrance on the end of a building adjoining an external or party wall, in which case the lifts and, if required, the staircase, may be spread along the boundary wall without interrupting upper corridor circulations, whereas in Figure 7 the entrance hall has corridors on each side at all upper floor levels; in consequence the lifts and staircase are placed beyond the main corridors and are thus grouped round a lift lobby, which allows the space over the entrance itself to be used as offices on all upper floors.

Lifts—The amount of lift accommodation needed in office buildings should be based on the possibility of handling one half of the total population of the building in about twenty minutes. The number of persons in

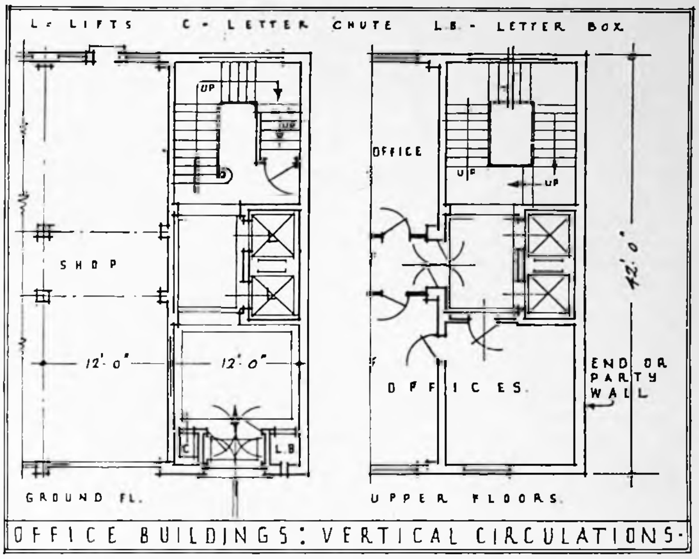


Figure 6

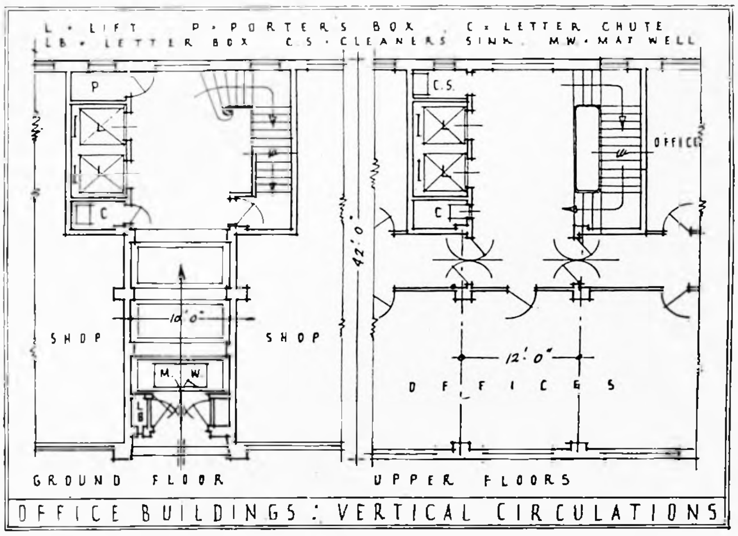


Figure 7

an office building should be calculated on the floor area of usable office space, taking as a basis one person for every 60 sq. ft. in general offices and about one person for every 80 sq. ft. in other rooms. The area of lift cars should be based on an allowance of about 2 to 2½ sq. ft. per person and the size of the well generally needed varies from 6 to 12 in more than the car itself in both directions, but these dimensions vary according to the height of the building, number of lifts in a common well and the actual lift sizes. The speed of lifts has very great influence on the number of persons that can be handled in a given time in a building of a fixed number of floors; for example, a car working at 350 ft per minute in a six-story building can handle about 100 persons more per hour than a similar car travelling at 120 ft per minute. The important comparison, however, is that although the speed of travel in the above example has been increased by 200 per cent, the handling capacity has been increased by only 50 per cent. This comparison serves to demonstrate the fact that in normal buildings in this country, it is the stopping time (controlled by rate of getting passengers in and out, ease of gate operation, and rapid acceleration and deceleration) rather than the running speed which really controls the handling capacity of lifts. It is advisable to install at least two lifts wherever possible in order to guard against breakdowns, especially in buildings of considerable height when the office floor area per floor is small; the only objections to the duplication of lifts are the increase of maintenance charges and staff requirements. Lifts may be controlled either by attendants or may be automatic, but in larger office blocks the former method is to be preferred. When automatic controls are used, every possible device to avoid stoppages of service—due, for instance, to doors not being automatically closed—are well worth the extra cost of installation. Lifts should all be grouped together unless the building is exceptionally large and has several entrances, or unless part of the building is occupied by one firm and the remainder let off independently; two separate lift installations may then be required, one group serving each set of accommodation. Ample lobby space is essential on each floor and it generally can be provided in conjunction with the staircase (see Figures 5 and 7). When lifts deliver directly into main corridors, the latter should be widened by about 3 or 4 ft at least in front of lift doors at each floor level to form waiting spaces.

Escapes—Alternative means of escape in case of fire is required to all parts of office buildings except in very small buildings which may be only two or three stories high. Local regulations generally lay down definite requirements regarding the number, type and positions of escape staircases. They may either consist of a second staircase within the building or an external staircase. In the L.C.C. area the width is determined by the London Building Act, which requires a minimum of 3 ft 6 in if not more than 200 persons are accommodated in the building, but if the number exceeds 200, 4 ft 6 in must be allowed with an addition of 6 in extra per hundred persons over 400; all doors must open outwards in the direction of the escape to the street and must permit a clear passage way of the minimum width necessary. Fire-escape staircases placed within buildings must be enclosed and have proper cut-off doors at each floor level; the staircases and enclosing materials, including all glazed screens and doors opening upon the staircase, must be fire-resisting. When open external staircases are used, all windows adjoining may be required to be fixed and glazed with wired glass;

doors leading to external staircases must be fire-resisting and hung to open clear of the staircase. Great care must be taken so that the position of escape stairs at ground level is such that immediate delivery to the street is easily available and, when the site permits, these should have access to streets other than that from which the main entrance is approached. Much other information relating to escape staircases is given in the sections on "Shops," "Factories" and "Municipal Buildings."

Mats—Proper provision should be made in all entrances for mats; these should be large, occupying at least the full width of the door openings, and having a width of at least 2 ft 6 in and, preferably rather more. Matwells should be placed inside the inner pair of draught doors when these are provided, as the outer set generally is continuously open during office hours, and mats are easily stolen where a hall porter is not always on duty.

Porters—Most buildings require provision for a porter in the entrance hall; the porter usually needs an enclosure which can be locked up securely and in the enclosure storage space should be provided in the form of pigeon holes for letters, racks for keys and shelves for parcels. When all the offices in a building are in the same occupation, the porters often deal with all enquiries and need considerable counter space; they sometimes have charge also of the switchboard of the telephone system if this is not so large that it requires a full-time operator. The size of porters' boxes may vary very considerably; it is mainly governed by the size of the building. In small buildings an enclosure about 15 or 20 sq. ft. in area is often sufficient, but in large buildings a small room is often necessary, having an area of 70 or 80 sq. ft.

Delivery and Dispatch of Letters—By arrangement with the Post Office a postal collection box may be installed in all larger blocks of offices, and this should be placed in the entrance hall. In large buildings postal chutes connecting all upper floors with the box on the ground floor are often installed; these should be placed, when possible, in or near the lift lobby on each floor. A planning point in connection with postal chutes which should not be overlooked is that they need a fairly straight and direct drop. The space required is small on upper floors, being about 12 in by 3 in.

In some large offices in one occupation a postal dispatch room is required, where all letters are delivered from the various floors of the building by means of a postal chute; the Post Office then arranges to collect letters in mail bags from this room.

Letter boxes should be provided to all offices, for use when the main doors are closed. These boxes should be strongly built, with strong back access doors and locks (see Figure 7). Where lettable offices are in various occupations, the postal authorities usually arrange (in office hours) to deliver letters to the various suites.

Notice Boards—Ample wall-space must be provided in entrance halls for notice boards on which the names of the various firms or departments may be displayed. These boards should be in a prominent position near the main entrance and between the entrance doors and the lifts or staircase. The lettering should be confined within a space between 3 ft 6 in and 7 ft 6 in above the floor; if it is above or below these heights it becomes difficult to read unless the lettering is increased in size. In large blocks of lettable offices, notice boards with interchangeable letters are frequently used, allowing for frequent changes to be made at minimum cost. Good clear lettering is essential.

Kiosks—In many of the larger blocks of offices provision is made in the entrance hall for the sale of tobacco, chocolates, etc., from a small kiosk; the area required for this purpose is very small, especially when storage space can be provided elsewhere—in a basement for instance. The total area provided is sometimes as little as 20 sq. ft., although this does not permit much space for the comfort of the assistant in charge. These kiosks, when of the lock-up type, generally consist of a small counter with showcases on each side, access being obtained by hinging the counter. Where the lay-out of shops permits, shop windows or small sales counters sometimes overlook the entrance hall.

Additional Lettable Space—In addition to office space in buildings of this type, there are a number of other possible sources of revenue, each of which is dependent on a variety of circumstances, such as the size of the building, the number and type of occupants and the position of site. The frequent demand for shops on ground floors—at least on the main street frontage—has already been discussed and when this applies, the rental value is usually greatly in excess of office rentals, while costs, maintenance and outgoings are smaller. When normal shops are, however, either unsuitable or undesirable for one of several reasons, there is still the possibility of providing certain lettable spaces other than offices, such as restaurants, suites for doctors or dentists, lettable conference rooms and even meeting halls, although the latter may complicate planning greatly if they are large, owing to the provisions necessary to comply with regulations as to exits. Restaurants may often be placed in basement spaces which are unlettable for office or shop purposes; they are usually let to outside operators, if they serve the general public and are not managed by the building owner.

Shops for barbers and tailors are often provided in office buildings which contain no other shops, since these trades do not necessarily require shop window accommodation and can be carried on in what is simply normal office space in the less valuable positions adapted to their needs. Consulting rooms for doctors and dentists are really suites of offices which are sometimes grouped for the use of several persons round a common waiting room; the normal accommodation of a suite for these purposes consists of a waiting room, a large room as consulting or working room, another room as private office or workshop and, if possible, a private lavatory.

There is often a demand for fairly large rooms which can be hired by the hour or day for holding conferences or smaller meetings. Where these are provided, they should seat at least 15 or 20 persons and are usually furnished in the manner of "board rooms," with large tables and comfortable table chairs. Sometimes a number of these rooms are placed *en suite* and

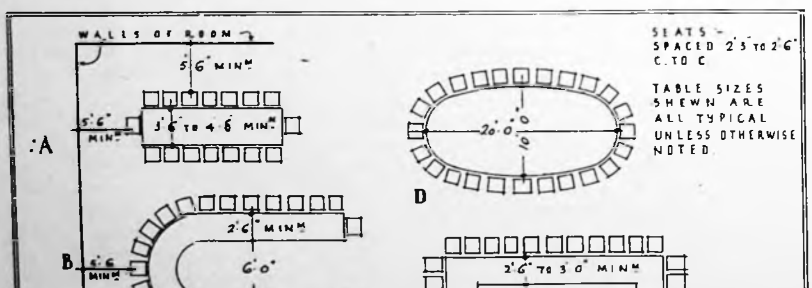


Figure 8

divided by large folding partitions, in order that rooms to hold varying numbers may be provided ; very great care and precaution should be taken to make these partitions sound-proof, since at meetings of this character, privacy and complete quiet are often essential ; positions away from external noise should be selected wherever possible.

If large meeting rooms are to be provided for such purposes as the holding of company meetings, they must be designed to comply with local regulations controlling public halls. The details as regards gangways, seating, galleries and general design are discussed fully in connection with assembly halls in the section on "Municipal Buildings."

Board Rooms—Rooms to be used as board rooms, small meeting or conference halls should be placed in quiet positions, preferably not overlooking main streets carrying heavy traffic, but when this is not feasible all reasonable precautions should be taken to make the rooms as quiet as possible. Information on this subject is given under the heading Committee Rooms in the section on "Municipal Buildings."

Figure 8 illustrates a number of different types of board room tables and seating. Tables should allow at least 2 ft 3 in and preferably 2 ft 6 in run per person, and when tables are used from one side only, the width should not be less than 2 ft 6 in and preferably more ; tables with seats on each side should not be less than 4 ft 6 in wide for comfort. The minimum dimensions for board rooms should be based on the table sizes needed to seat the requisite number of persons, with the addition of at least 5 ft 6 in at each side and end for chair space and circulation round the room ; door swings should be kept clear of these areas. The placing of the chairman is arbitrary ; some committees prefer him at the end of the long table, others at the centre, as is usual when open table plans of the "U" type are used. When large numbers have to be accommodated it is desirable that no member has his back to another, although this is sometimes difficult to avoid. Generally, tables are better if made in sections which can be re-arranged to suit the number of persons to be present at any particular meeting ; but with some types this cannot be achieved, as, for instance, when a large elliptical table is used, as shown in Diagram D of Figure 8. Opinions vary much on the best arrangement of tables and seating : each type has certain faults and advantages when factors such as room sizes are considered. Type A is the normal rectangular table with seats on each side, which is satisfactory unless the number to be seated is large, when the table becomes uncomfortably long and speakers are too far apart. Type B, although better from the point of view of seeing and hearing, necessitates a very wide room of exceptionally large dimensions. Type E is similar in some respects to Type B, but has the advantage that a table for secretaries may be introduced, or the numbers of the board increased. Type C shows a circular table, which is good from many points of view, but it is impossible to add an extra seat should this be necessary. There is also the slight difficulty that papers may be dropped into the enclosed space and are somewhat difficult to reach.

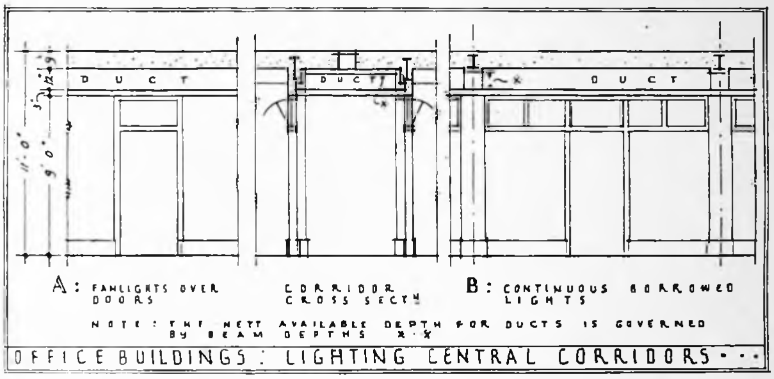


Figure 9

Office Corridors—Main circulation corridors should not be less than 5 ft wide, except in very small office buildings where the length of the corridors is short ; in long wings or blocks it is better if the minimum width is 5 ft 6 in. When the width is only 5 ft, or less, the corridor cut-off doors, which are generally pairs of double swing-doors, are necessarily narrow when the width of the frame is allowed for. The lighting of corridors by windows opening directly to the outside air is not important and on congested sites it can very seldom be managed ; other means of lighting and more particularly ventilation must therefore be provided. Lighting can be arranged either by the use of borrowed lights in doors and upper parts of partitions, or solely from artificial sources ; ventilation may be by means of a mechanical plant, ducts from external walls to the corridors, or by fanlights or opening portions in the partition walls. Offices placed on one side of corridors, although preferable in all ways, but especially from the point of view of light and air, are uneconomical, since the area occupied by circulation is so large in proportion to the usable office floor space. However, in country or semi-country districts, where site values are not so great, the feasibility of planning with rooms on one side of the corridor only, or at least with windows at the ends of corridors, should be considered. Since the minimum desirable height for corridors is usually much less than for the adjoining rooms, false ceilings may be formed in which ducts, pipes and conduits of the various services are placed ; this use of the false ceiling overcomes the difficulty of hiding otherwise unsightly casings or exposed pipes and ducts. When designing false ceilings for ducts the depth of the cross beams must be borne in mind, as these may take up a large part of the space between the structural floor and the ceiling. However, if stanchions are placed on both sides of the corridor instead of on one side only, the connecting beams will be comparatively shallow.

Figure 9 illustrates the formation of false ceilings over the corridors, and provisions for ventilation and lighting. Diagram A and the cross section show a space which may contain a duct for ventilation of the rooms if required and other services such as lighting and telephones. Fanlights over the doors provide ventilation to the corridor, but give very little light and constant artificial light is usually required. Access to the ducts, etc., for such services as telephones, gas and electricity, can be arranged in the floor of the corridor over. Diagram B of Figure 9 shows a similar arrangement as regards the false ceiling and duct space, but allows a continuous borrowed light from the height of the door heads to the false ceiling. This provides more adequate lighting of the corridor and a fanlight or opening sash can be used over the door for ventilation, as in Diagram A.

As regards the questions of privacy and penetration of noise from rooms to corridors, fanlights do not appear to cause much trouble and there is no loss of privacy when borrowed lights are kept high. When glazed or partly glazed partitions are used between rooms and corridors, care must be taken in the selection of the glass. In rooms in which there is considerable noise, such as those used for typewriting, addressing machines or accounting machines, glazed partitions should not be used owing to the penetration of sound. Fanlights and similar possible sources of noise from corridors should be avoided in such rooms as board and committee rooms, offices of important officials and rooms in which discussions of really confidential matters may take place.

When glazed screens are used as partitions between rooms and between

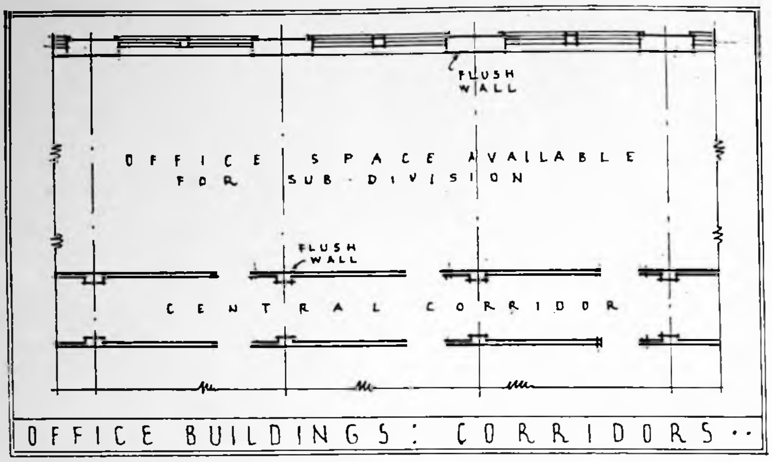


Figure 10

rooms and corridors, it is better to keep the lowest level of glass at least 4 ft 6 in above the floor, so that a normal four-drawer filing-cabinet and similar pieces of furniture are hidden and do not show in silhouette against the glass. Glazed partitions of this half-height are specially valuable on lower floors where the lighting is not good and high level borrowed light gives insufficient illumination to corridors. Partitions may be of wood or metal.

Partitions Between Rooms, etc—Figure 10 shows how the partitions between corridors and rooms should be placed between stanchions, so that they provide a continuous flush surface on the room side. This is an important point as, when placing furniture in the rooms, or in the arrangement or re-arrangement of internal cross partitions, the breaks necessitated by the stanchions are avoided inside, while in the corridors they do not cause any inconvenience. External walls may be made flush on the inside either by incorporating the stanchions in the wall thickness or by packing out on each side of the stanchions to form ducts for such services as heating pipes, telephone and electrical conduits. It is a great convenience to have these walls flush as there is little available wall space for furniture on this side of the room and if such space is broken up with piers its value is considerably reduced. It should be noted that the doors in the partitions shown on Figure 10 are placed near the stanchions, as this generally permits of better sub-division of rooms and, if the bay size permits, two doors to two separate small offices can be placed in one bay without difficulty. A central doorway, in an office one bay in width, breaks up the available wall space and also makes the arrangement of the furniture more difficult. Also, when it is necessary to subdivide a bay into two rooms, the doorway would have to be moved.

Doors to all normal offices should not be less than 2 ft 8 in and preferably rather more, in order to allow the easy handling of furniture in and out of the rooms.

Office Planning—As already suggested in the paragraphs on grid layout, rooms to be used for private or general offices should, to ensure good daylight, be not more than 20 ft deep from the window wall, especially on lower floors of high buildings when they overlook light-wells or courts. This depth may be increased to a maximum of 25 ft on very open sites, or if the heads of the windows are exceptionally high above the floor level. Offices are sometimes given greater depth in order to provide space for tables on which papers or files may be stacked, or for filing cabinets or plan chests, which do not need the same amount of daylight, since no members of the staff work in this darker area for any length of time. Offices requiring filing or storage space in conjunction with general or clerical offices are sometimes increased in depth by 4 to 8 ft to give the necessary floor area for the files and gangway space adjoining them.

Private Offices—Figure 11 illustrates a typical private office suite for an important member of an office staff, such as a departmental manager; such offices require an area of about 250 to 400 sq. ft. Rooms for more important persons, such as chairmen and managers, are sometimes considerably larger, so that small conferences may be held without occupying committee or board rooms. Frequently, adjoining a chief official's room, a smaller room is planned, for use as a private secretary's office or waiting room. Rooms for secretaries may be as small as 80 sq. ft. in area, although they are often as much as 200 sq. ft. to allow space for storage of papers, filing, etc. Figure 11 is shown based on a regular pier grid layout having about 9 or 10 ft spacing from centre to centre of piers. Two bays are allotted to the private room for the chief official and one bay to the smaller room for the secretary. Part of the secretary's room is sometimes cut off to form a small entrance lobby to the main room to avoid direct access to the person occupying the larger room; it is, of course, still necessary to provide a door opening directly into the corridor from the large room. Provision has to be made in the offices of the more important officials for a writing-desk or table with desk chair, bookcase, side-table, wardrobe, three or four additional chairs, and often one or two easy chairs. Some form of heating to augment the usual central heating is generally provided, and gas or electric heating units are becoming more usual than coal fires, as they are only wanted for short periods and for very limited periods in cold weather, since the central heating system is normally adequate. The desk or writing-table (except under special requirements) should be so placed that it has left-hand light and so that the main entrance door to the room is in front of the desk and in full view of the person seated in the desk chair. Direct access by the communicating door between the principal room and the secretary's room saves time and walking, but care should be taken to make the door and partition fairly sound-proof against typewriter noise and the reverse transmission of confidential conversations. The layout of the furniture in an office, other than the main desk and its relation to the windows and door, does not call for special planning and is purely a matter of personal preferences on the part of the occupier. Figure 12 illustrates a larger suite of rooms, comprising a principal office, a waiting room and secretary's room. There are several advantages in this type of suite as compared with the suite shown in Figure 11; for instance, the separation of the secretary and consequent reduction of noise and increase of privacy, the controlled entrance through the lobby and secondary way out of the main room. The lobby can be left open to the corridor, as shown on Figure 12; this permits of better light and air and less monotony in the corridor width. The scheme is based on the use of four regular units of the grid layout, two for the main room and one each for the secondary rooms. A small but important point of planning is to give the lobby sufficient depth, so that the doors to the two rooms on the sides (secretary's and principal's) can be placed far enough from the partition between the rooms and the corridor to allow space for chairs and filing cabinets behind the doors: these normally require about 2 ft 3 in. The suggested table layout shown in both Figures 11 and 12 for the secretary, providing for a typewriting table and an ordinary table to be within reach of a swivel chair, gives good light for typing and left-hand light for writing, a secretary having to use both types of table at frequent intervals, preferably without moving from the

chair. It is important that all doors to offices are hung so as to screen the person seated in the principal's chair. Waiting or interview rooms do not need to be large, an area of from 80 to 150 sq. ft. being ample ; it is seldom that more than two or three persons occupy the room at any time.

Desks—Desks and tables used in offices vary very much in type and size. High, sloping-top desks, about 3 ft 6 in from the floor to the front edge, with an allowance of about 5 ft, and sometimes rather more, per person, are regularly used for bookkeeping ; although in recent years there has been a tendency in many offices to change to tables at normal height, with chairs instead of high stools. The desks are generally from 2 ft 6 in to 2 ft 9 in wide, and are sometimes placed along window walls, leaving the remainder of the room for other types of desks or tables ; or they are put in single rows with left-hand light, or in double rows facing each other—which means that one row has right-hand light. The spacing between desks when clerks are seated back to back should not be less than 5 ft from desk to desk. When in single rows facing the same direction, the space between the back of one desk and the front of the next should not be less than 3 ft 6 in. Main gangways at the end of rows of desks which are open at one end only (assuming the desks go up to the window wall) should not be less than 5 ft wide, clear of obstructions such as open drawers of filing cabinets.

Typists' desks are of many types and sizes. It is usual to place the typewriter about 2 ft 2 in above the floor, which does not permit of knee-hole drawers ; but many typists' desks are normal 2 ft 6 in high desks with a sunk portion for the machine. The widths from back to front vary from as little as 1 ft 6 in up to about 2 ft 9 in ; the lengths vary from about 2 ft 8 in to 5 ft. Desks may be arranged either in single rows or back to back, the rows being at right angles to the window wall. The spacing between typists' desks in large typing-rooms must allow for easy circulation of supervisors, and the spacing should allow at least 4 ft between single rows and 5 ft between rows with typists placed back to back. The direction of light in relation to the machine is not important for typewriting, although it is preferable not to face towards windows ; top or high side-light shining downwards on to the paper and keys is an advantage.

Figure 13 shows average sizes and spacing of bookkeepers' and typists' desks ; owing to the great variation in sizes, however, the dimensions given should be used only as a general guide.

Desks vary considerably in size according to their use. Secretaries and clerks usually have desks from 3 ft 6 in (single pedestal) to 5 ft long (with double pedestals), and from 2 ft 6 in to 3 ft 6 in wide. There is a general tendency towards larger desks, as so much room is often taken up by letter trays, files and papers. Chief clerks and officials of lesser importance usually have double pedestal desks from 4 ft 6 in to 6 ft long and 3 ft to 3 ft 6 in wide. Departmental heads and chief officials often need larger desks or tables, say 7 ft long by 4 ft wide. Letter trays are usually 1 ft 3 in by 10 in and about 2 in high. Filing cabinets are generally foolscap size and four drawers high, the average size being 2 ft 3 in from back to front, 1 ft 7 in wide, and 4 ft 4 in to 4 ft 6 in high. Furniture may be of metal or wood ; stock pieces are approximately the same size in either material. The enumeration and detailed description of the many examples of special office furniture (such as stationery cupboards, visible filing tables, tables and desks for office appliances) is outside the limits of this section.

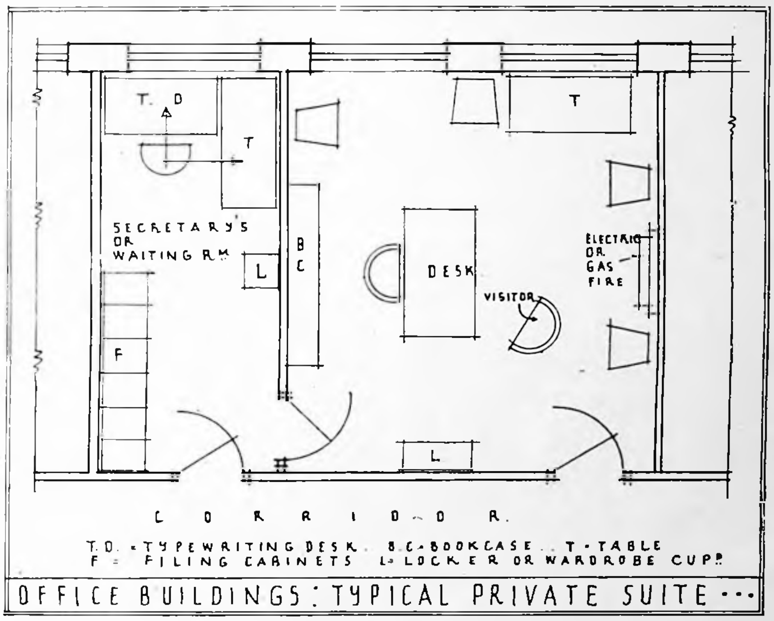


Figure 11

Figure 14 illustrates a typical clerical or general office, with a separate office for the chief clerk, and also an enquiry hatch or counter. The desks are all placed in single rows near the window wall, giving left-hand light, and leaving the remainder of the room clear for filing cabinets, sorting tables and circulation space. The filing cabinets are placed against the corridor wall so that the contents of the drawers have as much direct light on them as possible. Gangways should be at least 3 ft wide, clear of any obstructions such as open drawers.

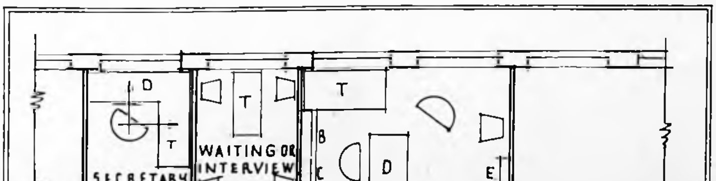


Figure 12

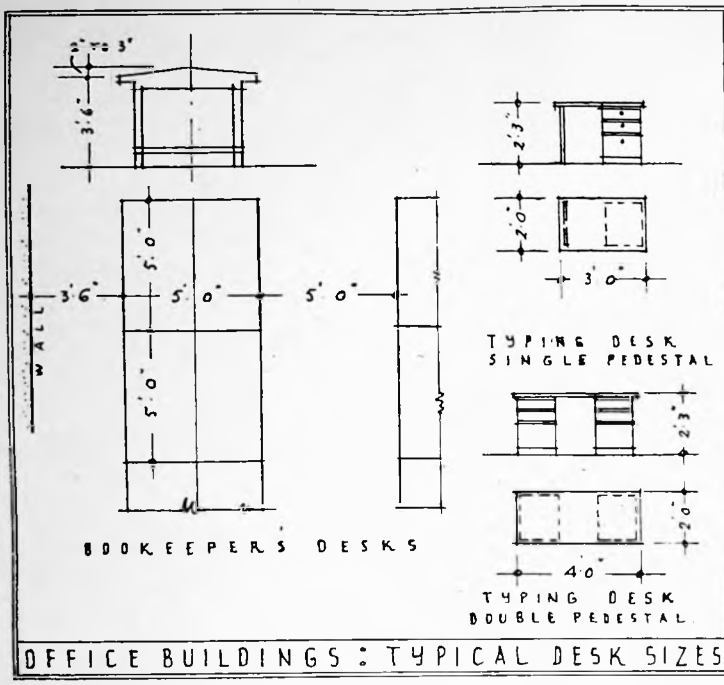


Figure 13

The distances between the front of a row of desks and the wall should be 4 ft 6 in, and not less than 4 ft should be left between the back of one row and the front of the next row, unless there are more than three seats in a row, when the space should be slightly increased. These sizes are, however, greatly reduced in many office lay-outs on congested sites where rentals enforce crowded conditions. The separate office for the chief clerk, who is likely to have more dealings with callers than any of the clerks in the general office, adjoins the public space. Such offices are frequently formed of glazed or partly glazed partitions, in wood or metal, extending to the ceiling. A hatch or door leading directly into the general office may be required. Enquiry counters are generally about 3 ft 6 in above the floor, and the public space cut off by the counter is sometimes divided by a partition fitted with a hatch. Space is usually needed adjoining enquiry counters for a seat or a number of chairs for visitors or messengers awaiting attention.

Rooms for Filing—In many offices entire rooms are devoted to files of documents, other than those in current or daily use, which are kept in clerks' or typists' rooms. Filing rooms may have to provide storage in several forms, such as filing cabinets, shelves for parcelled documents or books and for rolled papers such as drawings or maps. Racks are usually in the form of wood or steel shelving in units of about 3 ft or 3 ft 6 in lineal run ; they should, if possible, be not more than 7 ft or 7 ft 6 in high, although conditions may necessitate using the full height of the room.

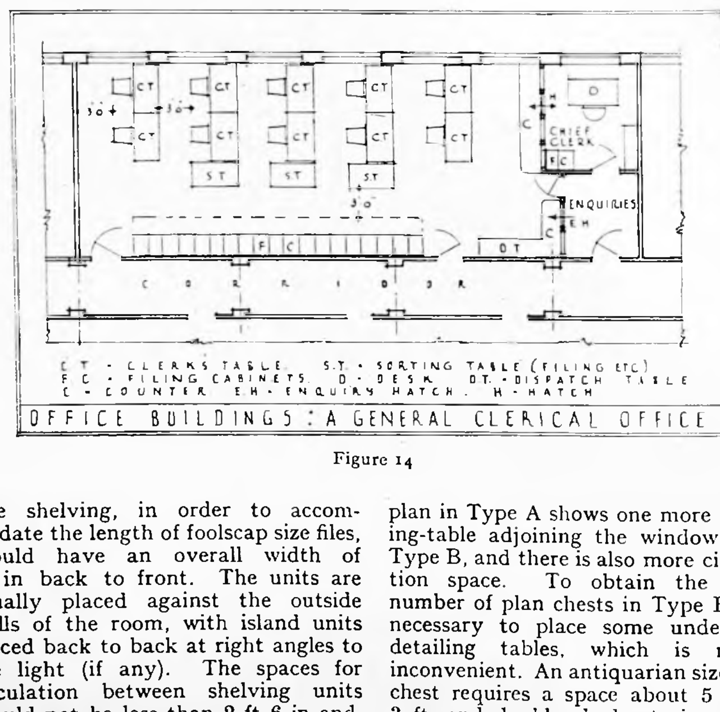


Figure 14

The shelving, in order to accommodate the length of foolscap size files, should have an overall width of 15 in back to front. The units are usually placed against the outside walls of the room, with island units placed back to back at right angles to the light (if any). The spaces for circulation between shelving units should not be less than 2 ft 6 in and, between filing drawer units not less than 3 ft 6 in, though 4 ft is better.

Rooms devoted entirely to filing and storage may be badly lighted, or may even need constant artificial light —unless clerks are always working in the rooms, when reasonably good daylight is, of course, essential. The other important factors are good ventilation and dryness without excessive heat.

Drawing Offices.—Many businesses require rooms for the use of draughtsmen. It is preferable that such rooms should have north or north-east light and, where possible, top north-light in addition. Top-light, though not strictly necessary, may more easily be arranged if drawing offices are placed on topmost stories of buildings. Figure 15 illustrates two typical layouts. Both examples show the drawing-tables placed adjoining the window wall, but in Type A, the draughtsmen face the window, whereas in Type B the light is thrown across the board from the left side. Draughtsmen generally appear to favour the position shown in Type A, but sometimes the criticism is offered that strong light is reflected into the eyes by the paper on the drawing-boards. Benches on which drawing-boards are to be placed should normally allow for the use of antiquarian size boards, and should, therefore, be 6 ft 6 in to 7 ft long per person and 3 ft 6 in to 4 ft wide. If drawing-tables, which may be set at any angle, are used with the T-square attached as part of the fitment, slightly less space may be found adequate, though a small table or pedestal of drawers is then often required, which occupies at least as much space as drawing-boards and benches. It should be noted that the plan in Type A shows one more drawing-table adjoining the window than Type B, and there is also more circulation space. To obtain the same number of plan chests in Type B it is necessary to place some under the detailing tables, which is rather inconvenient. An antiquarian size plan chest requires a space about 5 ft by 3 ft, and double elephant size about 4 ft by 2 ft 8 in. There are several types of vertical drawing files, and the sizes vary considerably ; in the types in which the drawings show, the flat side may be of much less projection than a drawer chest, but in those in which the drawings are arranged with one edge outwards the same projection is required as for a drawer chest, but the width may be less.

Filing drawer cabinets are usually needed in addition to drawing-files and Figure 15 shows these in alternative positions. Drawing-benches

should provide some drawers, but these should not be placed so that they impede the knee space; they are usually about 3 ft high. Tables should be placed 4 ft apart to allow sufficient space for a draughtsman to move about without touching the board or instruments of the person at the table behind. Four feet space is also necessary in front of drawing chests to allow for a draughtsman to stand at an open drawer. Chief draughtsmen are often provided with a separate office screened off at one end of a general drawing office by means of glazed partitions. A similar arrangement to that shown in Figure 14 works well, as enquiries and travellers may be dealt with at an enquiry counter or hatch, while the proximity of the chief draughtsman's office eliminates the necessity of callers entering the main portion of the drawing office.

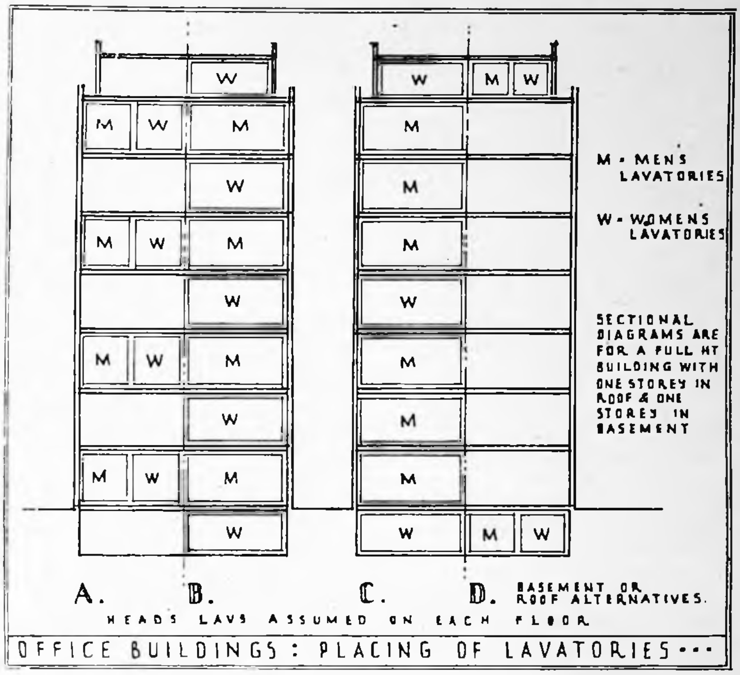


Figure 16

Lavatories—There do not appear to be any definite regulations regarding the provision of sanitary accommodation for office buildings, and the provisions as laid down for factory buildings are usually considered to be somewhat inadequate; several authorities on office buildings suggest that the requirements as laid down for secondary schools should be treated as a minimum. If an office building is to be entirely in one occupation, it is usually possible to obtain some idea of the number of persons who will be employed, but in lettable offices the probable size of the staff is often quite unknown and it is consequently necessary to base the numbers of workers upon usable floor area. It is general, therefore, to count 60 feet of usable office space per person and to assume that two-thirds of the occupants will be males and one-third females, except in special cases when there may be a very much larger proportion of females. In many buildings separate provisions are made for managers and heads of departments, either by placing individual lavatories with W.C.s adjoining the private offices, or by providing a special group of lavatories and W.C.s for the exclusive use of the chief officials; these special groups should be placed on every floor on which there are private offices and when convenient they may be placed in plan adjoining other general staff lavatories. When private lavatory accommodation is provided adjoining one private office and is used exclusively by its occupants, many districts will permit the lavatory and W.C. to open directly out of the office without a cut-off or ventilated lobby, but if the lavatory is to serve several rooms the full normal requirements as to cut-off lobbies must be complied with in all schemes. The amount of the accommodation is entirely dependent on the number of users for each group, but duplication of W.C.s, urinals and basins is always advantageous. The detail planning of sanitary accommodation is given in the section on " Lavatories : Public and Communal." For normal staff purposes and in lettable offices a good general basis for the number of fittings to be provided is, for males—one W.C. and one lavatory basin for every 15 persons up to 30 persons, and urinals on the basis of one for every 20 up to 40 persons and an additional one for every further 30 persons; and for females—one W.C. for every 10 persons up to 20, and an additional one for every 20 over the first 20 persons, with lavatory basins in the same proportion. In large lavatories for female staff in many modern buildings small gas-fired incinerators are also fitted.

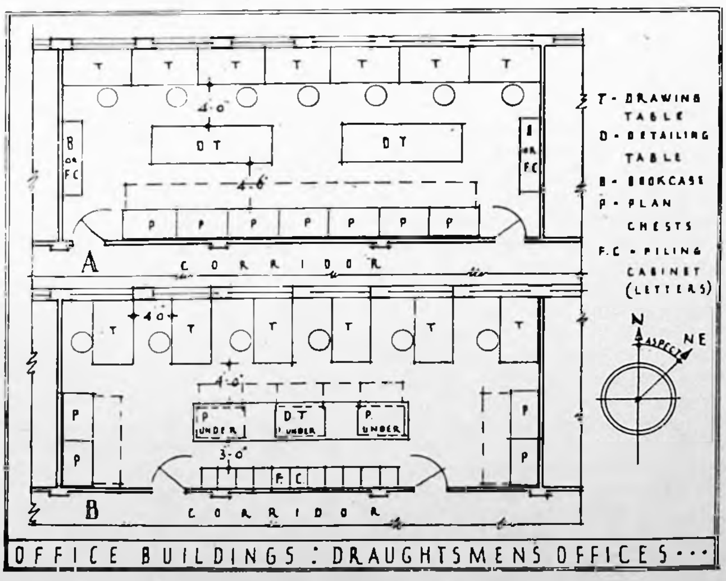


Figure 15

Placing of Lavatories—The placing of general lavatories raises a number of problems. In lettable offices, in which the numbers of each sex on each floor are unknown, one of three general positions is usual; first, lavatories for each sex on every floor, which is only necessary in very large buildings with correspondingly large areas on each floor; secondly, a lavatory for each sex on alternate floors as shown in Figure 16, Diagram A; and thirdly, lavatories for men and women, usually placed over each other and, if possible, near the main staircase, on alternate floors, so that the maximum distance that any person has to walk is one floor height, as shown in Figure 16 B.

If buildings are in one occupation, the placing is dependent on the staff numbers of each sex; when numbers

takes place) to a central storage room, usually in the basement, where it is sorted and arranged in suitable bins in readiness for collection by the local authorities.

Tea Kitchens—Tea is made in most offices, and consequently provision has to be made for suitable water supply in lavatories or elsewhere, and also water heating facilities provided. In small offices, gas rings or electric kettles are sometimes provided in typists' offices, but in large offices central tea kitchens are often installed with proper facilities, such as urns, a sink, china cupboards and trolley space; such a scheme is applicable only to large buildings where there is no canteen (if in one occupation) or where the size of building, number of tenants and their staff justifies the employment of someone to make, distribute and sell the tea.

Housekeeper—It is fairly usual to provide a flat for a resident housekeeper in large office buildings, but even if this is not required, a small office near the entrance is usually needed.

10. *Shops and Stores*

Introduction — This section deals with the planning of shops and stores for retail selling. Buildings for this purpose have four main divisions, namely, receiving, storing, selling and dispatching goods; to which must be added rooms for administration and for the comfort of buyers and staff. The methods of selling influence the planning of the building very considerably, as they vary from the "cash and carry" on the one hand to the most luxurious of exclusive shops dealing in one type of article only on the other and also include the department store. In all classes the following main factors must be considered: display and general attractiveness to purchasers, ease of sales transaction, flexibility or re-arrangement of floor space in the building and minimum cost of construction, maintenance and operation of the building.

Shops and similar buildings may be classified under the following main headings:—

(1) Departmental stores.
(2) Large shops dealing mainly in one trade.
(3) Small shops dealing mainly in one trade.
(4) Surburban, small town and village shops, also mainly dealing in one or two trades.

These classifications are necessarily rough, as each type includes buildings of vastly different character, organisation and plan. For example, in class one, must be included buildings such as Harrods and Woolworths.

Sites—Generally in every city and town there are districts in which nearly all shops come to be situated; even in these limited areas the architect is seldom consulted on the choice of site. There are, however, certain general factors to be considered in every shopping area, whether of first-class or second-class; such as, the "right" side of the street, stopping-places for public-transport vehicles, the size and shape of the site and its relation to the surrounding streets. In regard to the side of the street, the sides which are sunny during the late morning and afternoon generally provide better sites, as the public prefers the sun and its warmth; in hot climates the reverse is naturally the case. It has been found that shops of a similar nature and quality in the same neighbourhood are not a disadvantage, except in suburban districts. The best site for any shop is the one offering the best opportunity to sell goods, where people *naturally* come to trade, either because of convenience or through habits of association. All things being equal, the site passed by the greatest number of the right type of public for each particular business is the most valuable for ordinary retail purposes, excepting the exclusive luxury shop. Corner sites have some advantages, but congested traffic makes them unsuitable for some trades. Such sites have the benefit of more external wall for display and light, easy access from two streets and, in addition, more persons pass by the display windows. The surrounding streets need special consideration with regard to the possibility of obtaining separate delivery for goods away from entrances to be used by the public. In the case of large shops and stores, frontages on at least two streets are practically essential. Even for small shops in the suburbs or small towns, it is a great disadvantage and inconvenience to general traffic and to the customer arriving in a private car, to have delivery vans standing in front of a public entrance.

Under the Restriction of Ribbon Development Act (1935), it is now possible that local authorities may require special "draw-in" facilities for the taking-up and setting-down of passengers and the delivery and dispatch of goods; such facilities being within the area of the site of the building.

Figure 1 shows a number of typical shop sites in relation to the surrounding streets and the disposition of the access and circulation for public and goods. Type A has public access from a main street only with a minor street available for goods access, both delivery and dispatch together, or separated if desired. Type B has access for all purposes from one street only; therefore, the public and goods entrances are separated as far as possible; but here the vertical circulations may be grouped to economise floor space.

Type C is a normal corner site, with public access from two streets. The public entrances on the side street should be as far away from the goods entrance as possible and the public vertical circulation should be related to the two entrances in such a position as not to divide the selling space unduly. Type D shows a corner site having frontages to three streets, two of which are of less importance than the third. The public entrances are concentrated near the main frontage, and the delivery and dispatch of goods are placed one on each minor street at the rear of the site, while the vertical circulation for goods is in the centre of the site, behind the public circulation, which is placed equidistant from all the entrances, but in such a position that customers must pass through the shop and its display counters to reach the lifts or staircases. Type E is a long island site having a minor street in the rear from which deliveries and dispatch are

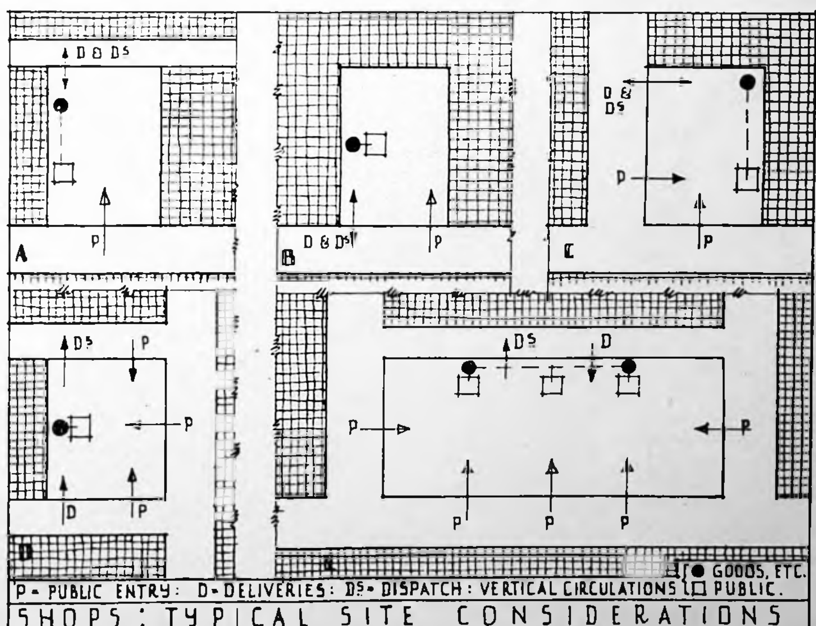
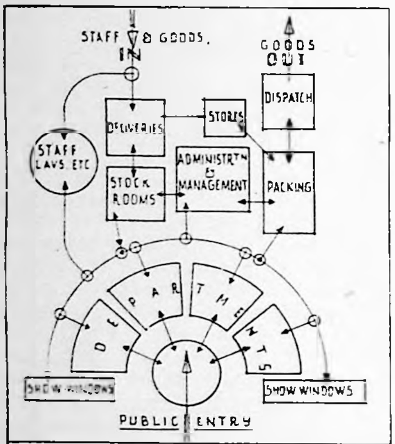


Figure 1

made, while the public enter from the other three sides. The vertical circulations are divided for the public to allow them to leave the building easily and the goods are divided into arrival and dispatch. Shop sites in new developments where open sites are available, as in new suburbs or towns, will be considered later in this section.

Figure 2 illustrates in diagrammatic form the essential circulations of goods, staff and public in large shops and stores.



SHOPS : ANALYSIS OF CIRCULATION

Figure 2

Departmental Stores—This type of shop has to deal with vast numbers of customers in very many departments, each of which is separate in regard to some matters, such as buying of goods, but shares services such as deliveries, dispatch and administrative offices. There appears to have been, in recent years, a tendency to make each department a separate shop within a shop, even to the extent in one or two cases of having separate main entrances to certain sections. The main planning considerations are circulation of customers and housing and display of goods and may be divided under the following headings :—

(1) The relative positions of the entrances and exits both main and subsidiary for public, staff, and goods and their relation to the streets.
(2) The position of the vertical circulations, lifts, staircases and escalators in relation to the entrances and selling space.
(3) The possible height of the building.
(4) The stanchion lay-out for efficiency of construction and arrangement of fittings.
(5) Position of administration, a chief factor in which is the amount of cash sales and whether a centralised cash department, or a counter cash receipt system is adopted.
(6) In the case of large sites consideration of arcade planning or recessed show-window areas.

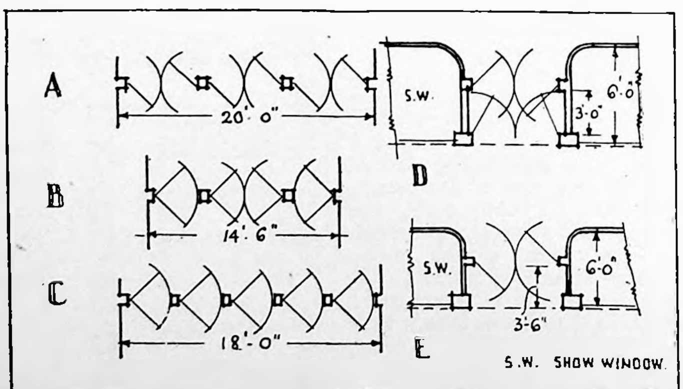
To these principal factors must be added such matters as rights of light, basement depths affecting underpinning of adjoining property and any special departments such as restaurants.

Sites for Stores—A departmental store must have access to one secondary street in addition to the main approach street and in the case of very large stores an island site is virtually a necessity. A long, narrow site has the advantage that light wells, which cut up the floor space and often make internal lay-out difficult to arrange economically and satisfactorily, are unnecessary.

Entrances—To ensure proper and complete control and to avoid the wasting of frontage useful for window display, entrances should not be too numerous. An American authority suggests that there should not be more than one entrance for each 80 to 100 ft of frontage, but this is, to a great extent, dependent upon the number of exits and escape staircases required by the local authority. In ordinary circumstances entrances should not be placed on corners, as these are too valuable for displays which may be seen from far away ; also doors on the corners deliver customers into the most crowded parts of streets. Entrance doors may be arranged in various ways, as illustrated in Figures 3 and 4. Two doors at each entrance should be provided in all large shops or stores, each swinging both ways, to allow persons to enter and leave at the same time. Doors may be hung either in pairs, as in Figure 3 A, or singly, as in Figure 3 C, or in a combination of the two, as in Figure 3 B. The single type has the advantage over the double type in avoiding confusion, as there is one door for each person entering or leaving and these are now generally preferred.

Figure 3 D and E show two typical arrangements of a pair of entrance doors ; in D external doors are shown, which, if they are to open inwards, must be fixed open during business hours ; E gives a single pair of doors which have to be set back from the face of the building to prevent the outward swing from obstructing the pavement. In each of these examples it is desirable to make the depth of the display windows or showcases sufficient to prevent the doors swinging into internal circulation space.

Entrance doors are better if set back from the frontage in order to form a lobby which acts as a pause between the pavement traffic and the shop itself. These external lobbies may easily be formed in the depth normally required for the display windows and are generally the most satisfactory type of entrance. Entrances should be without steps as far as possible, any changes in level required by falls of the pavement on a long frontage being dealt with on the ground-floor level inside the building. If steps have to be introduced, they should be set back from the pavement and also have a landing in front of the actual doors as shown in Figure 4 C. Figure 4 illustrates three typical entrances ; Type A shows a normal direct entrance, combined with a staircase which may serve both basement and upper floors, but the lifts cannot be reached except by access to the ground floor and therefore the staircase is normally useful for escape purposes only. Type B shows a good corner entrance, if in any circumstances this position has to be adopted. It permits easy access to both streets without using the actual corner and therefore provides a lobby space which is otherwise difficult to plan. Type C shows a combination of an entrance to the ground floor and direct access to the basement and/or the upper floors. All entrances should be capable of being closed at night on approximately the frontage line either by folding gates or doors.

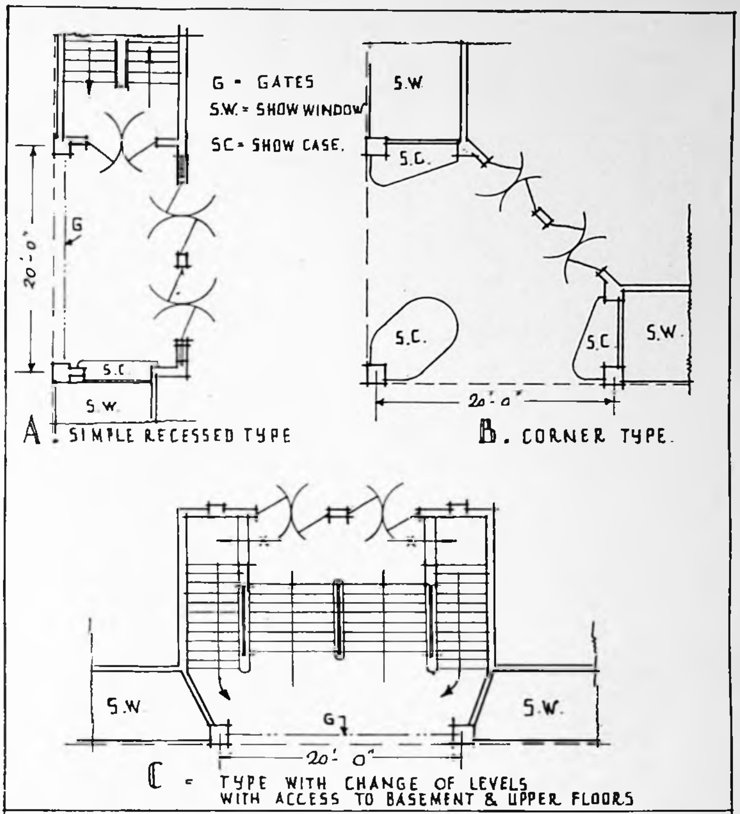


SHOPS : DEPARTMENTAL STORES TYPICAL EXTERNAL DOOR ARRANGEMENT & SPACING

Figure 3

Column Spacing — The column spacing is a vital point of the planning, as it must be designed to meet the typical lay-out of the selling floors. The owners of stores like the columns to be reduced to the minimum number; it has been found that a spacing of 21 to 22 ft centre to centre allows the most satisfactory lay-out of counters and showcases for general purposes, although in some shops spans of 25 ft have been adopted. Beams must not be very deep, as they reduce head-room on each floor, often a serious consideration where total heights are limited, as in the L.C.C. area.

Floor Areas—In other countries and in some cities in this country (other than London) there are no restrictions as to cubic contents or area of clear floor space, thus greatly facilitating planning; but within the L.C.C. area it is impossible to adopt a fully open plan owing to the regulation that buildings must be divided into cells not exceeding 250,000 cu. ft. each, to avoid rapid spread of fire. These cells may be arranged horizontally as one floor over another or in units side by side, separated by fire-resisting division walls or partitions, and connected only by self-closing fire doors, or enclosed lift shafts or staircases. This restriction makes the use of escalators difficult in the L.C.C. area and prohibits the large monumental staircases running through all floors, which are used so much abroad with great display value. The limited cubic content also makes planning with open wells between the floors difficult to arrange for more than (generally) two floors together. It has usually been found most economical to place the fire-resisting divisions vertically and use automatic self-closing steel shutters or doors. Vertical divisions also permit of the use of open lifts and staircases from which the various floors may be seen; this is often required as an advertising asset. Sometimes the L.C.C. will consent to this 250,000 cu. ft. being exceeded when exceptional precautions are taken to reduce fire and escape risks to the minimum. Outside the L.C.C. area the regulations are more lenient, but in all cases the fire insurance authorities favour reasonably close adherence to a code similar to that of the L.C.C. The L.C.C. code in regard to openings in division walls separating units of 250,000 cu. ft. requires floor jamb and head to be of fire-resisting materials and to be closed by two metal doors or shutters of specified thicknesses placed the full thickness of the wall apart and fitted in grooved or rebated metal frames. The openings are not to exceed 7 ft in width and 8 ft in height unless the doors are 24 in or more apart, when they may be up to 9 ft 6 in high; nor must the openings taken together exceed one-half of the length of the wall. Division walls are generally based on party-wall



SHOPS: DEPARTMENT STORES: TYPICAL ENTRANCES

Figure 4

thicknesses or any special construction and thicknesses to which special assent may be given by the authorities concerned. Division floors must be of approved fire-resisting construction with all vertical communication between floors adequately cut off.

Vertical Communications — The placing of the main vertical communications, such as the staircases and lifts, is of the utmost importance in the early stages of all schemes for store buildings. Generally, the main staircases and lifts should be grouped together on the main wall immediately opposite the main entrance, in order to circulate customers past the maximum amount of display area, particularly for special or "bargain" goods which are often allocated to the ground floors. Lifts placed near the entrances, although permitting customers to reach and leave the upper floors more quickly, tend to cause congestion near the main doors and wastage of valuable selling space. By placing the lifts at the end of a broad aisle opposite the entrance, a strange customer entering the shop will have little difficulty in finding his way about.

Vertical communications are closely connected with "means of escape" in case of fire and, at least so far as staircases are concerned, all subsidiary types act for both service and escape. The means of escape, which are seldom laid down by local authorities, but must be to their satisfaction, depend on the following circumstances: the area and disposition of the building, the number of persons for whom escape must be provided, the construction of the building and the provision of fire-alarm systems, sprinklers and other appliances; the general principles are that there should be at least one enclosed and protected staircase and exit and, in addition, an alternative means of escape such as another enclosed and protected staircase and exit, a suitable staircase in another block to which access may be obtained by door openings in party or division walls, or by external means such as external balconies to adjoining buildings, or external iron staircases. Alternative means of escape on each floor should be as far apart as is practicable. Figure 5 shows two half-plans of store buildings with alternative positions for the vertical communications. Example A places the main staircase and lifts in the centre of the plan but near to the front street, and it will be seen that the entrance is cramped and customers tend to go to upper floors without entering the ground floor, also the lifts are somewhat difficult to find on entering, except from the side street, whereas in Example B the lifts are directly opposite the main entrance, in full view of customers entering the store, and necessitate their crossing the store past several display counters. In Example B the main staircase is made

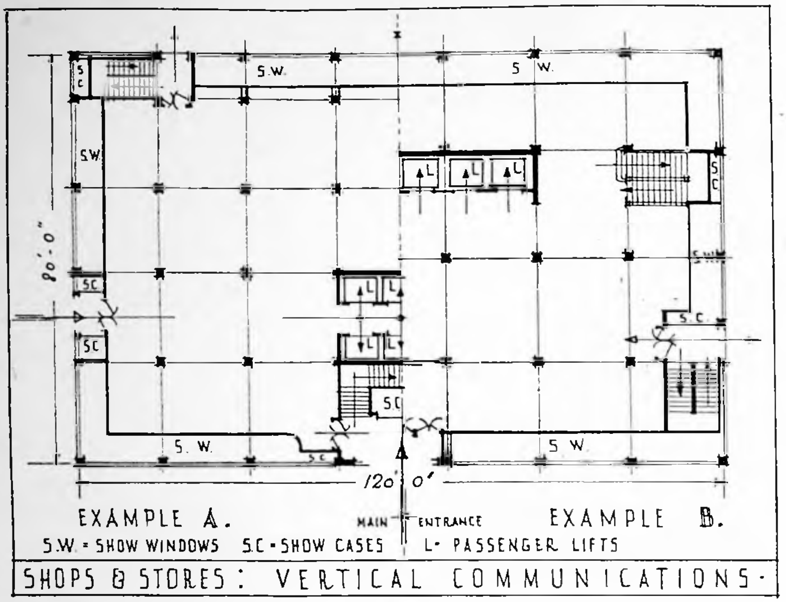


Figure 5

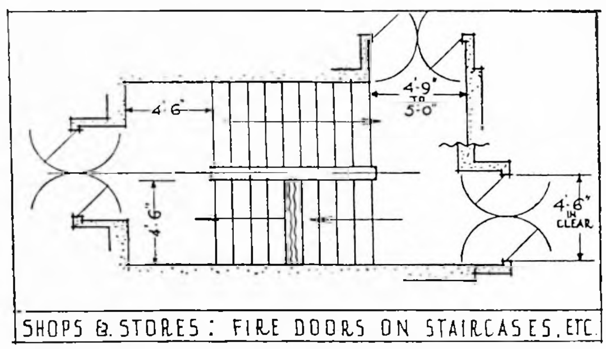


Figure 6

of less importance and is duplicated on each side of the battery of lifts, which involves, in a plan of the same area as Example A, an additional staircase. In both examples the lifts are grouped together, but in A the space adjoining them is rather more cramped, although the whole group may be cut off for fire purposes by two fire doors on each floor, instead of one to each lift as is needed in B. The arrangement in Example B is convenient for the planning of goods lifts behind the passenger lifts, and also cuts off satisfactorily a portion of the floor area for service purposes such as stock, staff, and packing rooms.

Staircases—The number and placing of staircases is entirely dependent on the amount of the floor area and any subdivision required for fire purposes ; it has been suggested that there should be 1 ft width of staircase per 1,000 sq. ft. on each level, but this appears to be somewhat excessive. The L.C.C. normally bases its requirements for staircase widths on the number of persons using the staircase, which, for store buildings, is difficult to determine. Staircases for stores are usually made 4 ft 6 in or 5 ft wide and are generally increased in number if these suggested widths seem insufficient for the probable traffic. In the L.C.C. area they can only be open if the space connected does not exceed 250,000 cu. ft., and they are therefore generally enclosed with fire-resisting materials having fire cut-off lobbies at each floor ; they must be constructed of fire-resisting materials and should have continuous handrails on both sides, except across door openings. Doors opening on to staircases must swing clear of the normal passageway and open outwards from the selling floor. Doorways should be at least 4 ft 6 in wide in the clear, while the doors should be self-closing and be of fire-resisting materials. Staircases should have adequate natural light and be ventilated by windows, which implies that they should be placed on outside walls ; a further reason for this placing is to make escape to the street easy. Staircases should have treads at least 10 in wide clear of nosings, and risers of not more than 7½ in. Escape staircases should, generally, give access to the roof. Figure 6 shows typical arrangements of doors opening on to staircases and the way in which they must be set back to avoid opening into the passageway ; it should be noticed that it is generally necessary to increase the width of landings when doors open on to them at right angles to the direction of the flights in order to provide sufficient width for a clear door opening of 4 ft 6 in.

Escalators—Escalators are being used in a number of store buildings in this country and in various parts of the world. They have an advantage in distributing the customers more evenly and speedily through the building and thus increasing, very largely, the sales value of upper floors. Escalators are only of value in shops or stores having a high traffic density. It is claimed that a small one-passenger escalator (treads say 2 ft wide) will handle in a store building as many passengers as a battery of ten normal-sized store-building lifts (approximately 4,000 passengers per hour), and that the normal width (about 3 ft treads), similar to those used on the London Underground railways, are about equivalent to twenty lifts, or 8,000 passengers per hour. In London, where fire regulations limit the cubic capacity of any section of the building to 250,000 cu. ft., the escalators being open from floor to floor must be enclosed within fire-proof construction, cutting off the escalator circulation from the remainder of the building at each floor, similar to the methods adopted for staircases. Where both lifts and escalators are used these may be combined with the main staircases within fire-proof construction, having walls and fire doors to accord with regulations. The advantages of escalators are : no waiting, no operators, low power cost, and reversibility at rush hours—a useful feature at opening and closing times, especially during clearance sales. Escalators, when used, should be placed in the main circulation arteries and they usually run at an angle of 30 deg., a speed of 90 ft per minute, the motors for each unit being placed underneath the floor at the top of the slope. Escalators at first appear to require much floor space, but actually only about 85 sq. ft. is needed at both upper and lower landings for the narrow type. Continuity from floor to floor is difficult to arrange, as the escalators stretch across the building for too great a length if they are placed end to end, as in Figure 7 C, and therefore they are usually arranged when serving several floors, either over one another, as in Figure 7 D, where they serve in one direction only, or crossing over each other as in Figure 7 E, where they serve in both directions, which leads to less congestion on the floors, as the next flight in each direction adjoins the other, though this makes customers circulate less through the selling space than arrangement D, where customers must walk between the ends

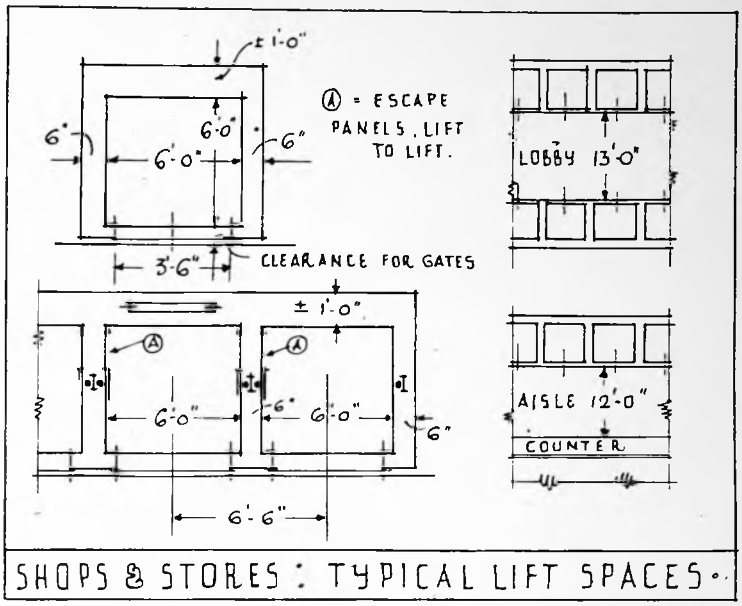


Figure 8

of each flight. The placing of the two escalators for each direction of traffic together or separately, as shown in Figure 7 A and B, is an arbitrary matter, but it is probable that Type B is better, as it leaves the centre aisle clear to a view of the lifts, etc., beyond, but it involves more difficult floor construction, as two separate openings have to be trimmed on each floor and is only applicable to buildings where two or three floors are required to be served, but the escalators in Type A, on the other hand, are less disturbing to the regular lay-out of selling counters and fittings. Diagram F, in Figure 7, illustrates a typical section through an escalator and the amount of space required for the installation. The important factor arising in the design of escalators is the point of intersection of the plane of the steps and the floor levels, on which the whole setting-out on the part of the engineers is based. The motors are generally placed on the top of each flight, but the amount of space occupied below the floor level with usual floor heights permits of placing showcases or even counters beneath. Well-designed escalators need not involve much noise but wherever possible every precaution should be taken to insulate the sound, more especially by lining the casings with sound-absorbing materials.

Lifts—Lifts for customers should always be grouped together, and not scattered over the floor area, in order to provide alternative accommodation and avoid waiting. Adequate circulation space is important in front of lifts at all levels. If a lobby arrangement is adopted, at least 13 ft is desirable between the two batteries of lifts and, in the aisle arrangement, at least 10 ft should be allowed between the lifts and counters. Several small lifts working at well-controlled time intervals and high speeds provide a much more efficient service than a few large ones. The average size generally installed in store buildings has a cage about 6 ft by 6 ft, which will accommodate in rush periods about twenty passengers. In some stores the lifts are divided into groups, serving only upwards or downwards to avoid confusion, this arrangement being specially easy to provide in the lobby type of grouping, where each side carries passengers in one direction only. Sometimes also lifts are specially allocated to serve one floor or room only, such as a restaurant. The average store-building lift has a maximum capacity of about four hundred passengers per hour. To calculate the number of lifts required is extremely difficult, but, in America, where staircases are little used and the lifts work to higher capacity, the number of passengers is frequently calculated to be one per hour to every 25 sq. ft. of floor space for peak loads in busy city stores. Lifts should be equipped with every available device to increase the speed of operation, such as self-levelling gear and proper indicators. Indicators are most satisfactory when they show the complete movements of the lifts rather than simply that the car is going upwards or downwards, as passengers may then collect in front of the first one that is likely to reach their floor in the direction they intend to go.

Lift doors need careful consideration and sliding types which open sideways should be selected in preference to hinged doors opening outwards from the lift towards customers waiting on the landings. Doors should be controlled by operators and not automatic; they should be at least 3 ft 6 in wide and are better the full width of the lift cage for rapid loading. Machinery is often placed at the top of the building, if basement space is too valuable. Lifts should be able to serve all floors, even if they are designed primarily to connect only to special rooms, and should deliver passengers on the same side of the cage on each floor, as any alternative makes for confusion

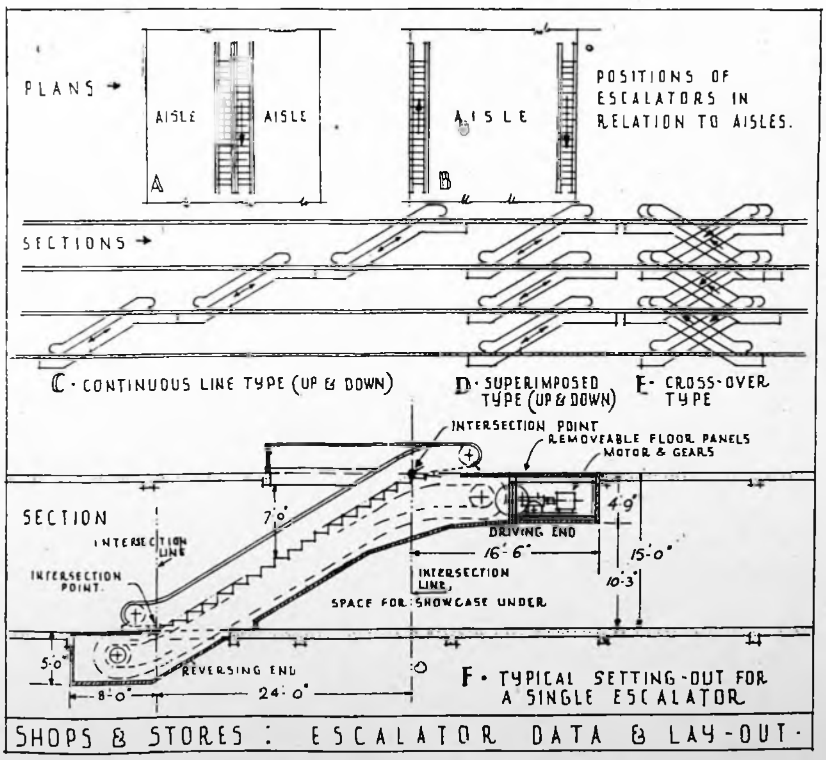


Figure 7

of passengers and for difficulties for the operator. Figure 8 shows the typical spaces required for lifts and their installation, but the dimensions vary with the size of the lift and its counterweights and particularly with the type of door used if the clear opening width of the car is required. It is desirable to have access panels in the sides of the cars for use in the event of breakdown. For the same reasons as in the case of staircases, lifts generally have to be enclosed for their full height with fire-resisting materials and have fire-resisting doors or fire shutters; the shafts should be carried up, if possible, above the roof and be covered with thin glass which will break in the case of fire and form a flue. Where lifts are in open wells, they should be placed away from access to the escape staircases.

Floor Heights—Floor heights are largely governed by the total building height limits set by local authorities, and which are generally related to the widths of surrounding streets and town-planning zones. Selling floors should have a height of at least 12 ft, but more than 14 ft is generally unnecessary. Ground floors are frequently made somewhat higher than other floors in order to provide light and ventilation over the shop windows. Floors not used for selling but for administrative purposes should have a clear height of 10 ft 6 in. Several basements are often installed, at least one of which is useful for selling purposes; the use of more than one basement is usually due to the desire to obtain the maximum amount of floor space in a building of limited height, the lower basements being used for stockrooms, staff cloakrooms, sorting, dispatch and engineering plant rooms.

Daylight to Selling Floors—The amount of daylight required for the selling floors of shops and stores is a very controversial subject; undoubtedly large window areas save the cost of artificial illumination for many hours in the year except on very deep sites without internal lighting wells, but many shopkeepers prefer to sell by artificial light or desire to place fittings or small rooms such as fitting-rooms along the outer edges of the selling space; the placing of fitting-rooms on the outside having the advantage that customers may have goods, etc., tried on in natural light. Ground floors, by reason of the display windows on the façades requiring solid background, seldom have more than a very small area of window above the main display area.

Floor Loading—The amount of superimposed load to be carried on the floors varies very much in different sections of a store building, but it is advisable to calculate for an unduly heavy load throughout to guard against departmental changes in the future. A good average load is about 1½ cwt per sq. ft., but this is often increased to 2½ or even 3 cwt where linoleum, carpets, or stacks of fabrics are stored. The L.C.C. new steel code, under section 58 of the London Building Act, requires the superimposed load in "retail shops" to be taken as 80 lb per sq. ft., and in warehouses and buildings having similar uses the actual load is to be calculated, but to be not less than 200 lb per sq. ft.

Distribution of Departments—There are few special positions for the various departments of a store building and many different lay-outs may often be found even in adjoining stores. It has been customary in many to place the "bargain" departments in the basement, food sales on the ground floor or basement because of the rapid handling of goods that is required, women's clothes and millinery on the first floor, together with lady customers' toilet, rest and writing rooms, although these are frequently attached to the restaurant, which, if provided, is generally placed on the top floor with its kitchen; men's departments should be readily accessible from the street. It is general to place the departments having the greatest activity on the lower floors, so that the volume of traffic decreases as it rises, thus providing the greatest convenience to the largest number of customers.

Circulation of Goods—Having considered the main circulation of customers, it is now necessary to turn to the circulation of goods, staff and administration, bearing in mind that the only normal contact of the two sections is at selling counters on the various floors. The main lines of circulation for goods is as follows: Receiving and stockrooms, from which goods pass to the selling departments, after which they are packed and dispatched; the receiving and dispatch of goods should, if possible, be entirely separate, to avoid confusion and delay. The goods are delivered to the store either by lorry directly from the manufacturer, or from shipping and railway companies, messenger, or post. On arrival they must be checked, unpacked, sorted, marked and sent either to stockrooms or direct to sales counters; the receiving department must therefore provide adequate working space for these purposes, together with offices, the actual size being dependent on the size of the store and the type of goods it sells. In very congested areas in some American cities where there are main streets on all frontages, the lorries bringing goods to the store are placed on lifts and taken bodily with their load to the main stockrooms, which are combined with the receiving rooms; such a procedure is generally unnecessary in this country, as an unimportant street front is usually available in which may be arranged unloading docks into which the lorries back without interrupting the street traffic. Loading docks require considerable space, as lorries vary in length from about 18 ft to 33 ft overall and are up to 7 ft 6 in. in width. The minimum length of the dock provided should be 21 ft. Figure 9 illustrates the minimum dimensions required for a dock to hold two vehicles at one time, which is generally the minimum number for which it is wise to make provision. The entrances are generally closed by roller shutters at night. The dock itself should be about 3 ft 6 in above the roadway level, to facilitate unloading and it is convenient, although frequently impossible, if the levels of the dock and the ground floor of the store coincide. Adequate space is essential between the lifts and the edge of the dock for handling and unpacking goods and container trucks, at least 10 ft being desirable. The main goods lifts must be carefully related to the receiving

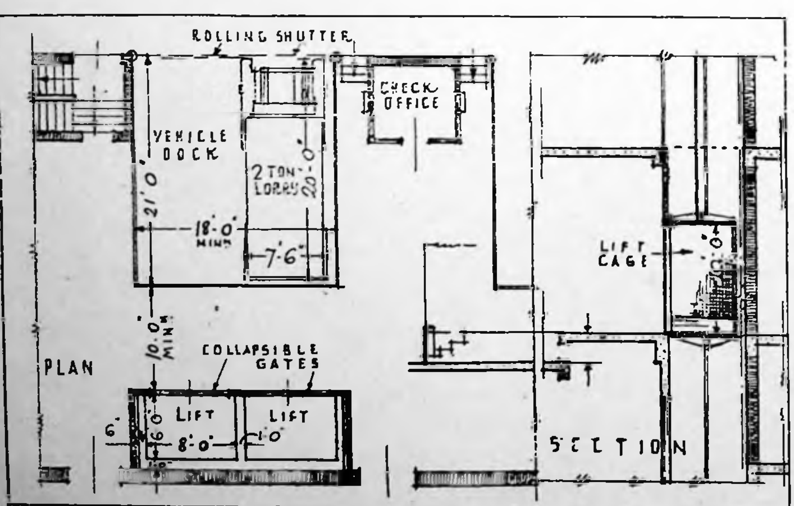


Figure 9

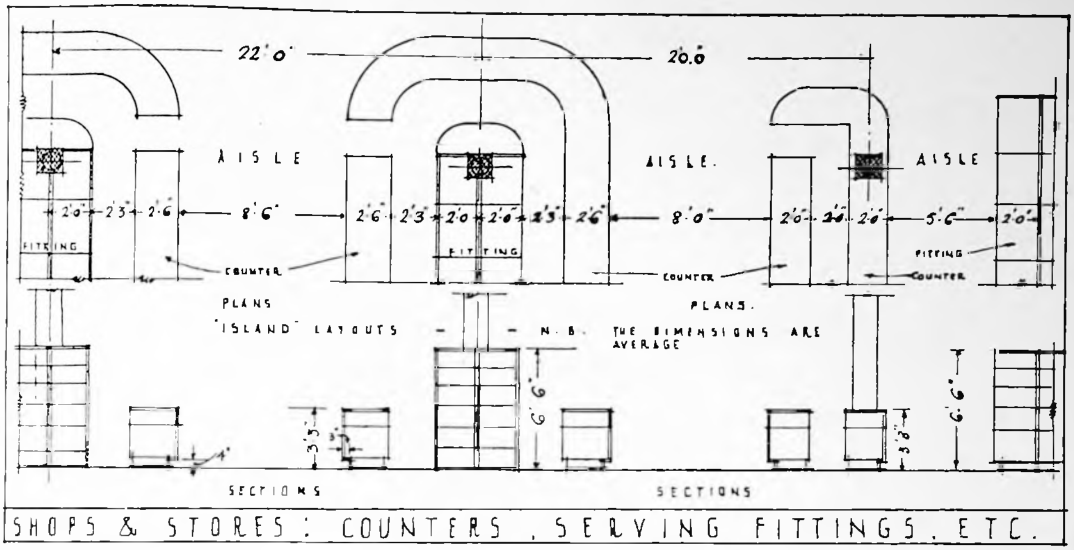


Figure 10

docks to avoid excessive handling and are best placed as shown in Figure 9, opposite the backs of the delivery vans; the lifts are generally better also if the greatest dimension of the car is the width rather than the depth. The lifts connecting the floors and the receiving department need to be rather large, as not only large goods such as settees and pianos have to be carried, but also large fittings for use in the shop itself. These lifts should be at least 8 ft wide, 6 ft deep, and 10 ft high.

Stockrooms—The lifts from the receiving rooms take the goods either directly to the selling floors or to the main stockrooms, which may be either in the basement or on an upper floor. The basement or sub-basement is the most general position for stockrooms, although sometimes it is argued that top floors are more satisfactory for distribution to selling floors and also that basement space, being nearer the street, is more valuable for selling space. The equipment of stockrooms consists mainly of metal adjustable shelving and metal bins divided into compartments by metal mesh partitions. Gangways must be at least 3 ft wide to permit easy movement of trolleys, in which smaller goods in bulk are handled. To ensure easy readjustment of storage space the equipment should be standardised as much as possible. Good lighting is important, though daylight is not specially needed and the rooms should be dry and well ventilated. Departmental stockrooms are generally placed adjoining each selling space, but concealed from it. Adequate vertical connection between the stockrooms and the floors must be provided either by service lifts, dumb waiters, or chutes, the latter only being possible if stockrooms are on top floors. After sale, the goods must be wrapped for removal by the customer or delivery. In the first case it is essential that wrapping may be done near the selling counter in the minimum of time. For delivery separate packing rooms on each floor are often provided, or occasionally goods travel to a packing room near the actual dispatch department. In both cases gravity chutes are often used to connect the various floors to the delivery sorting room for the transport of small parcels or of standardised containers in which the parcels are placed. The sorting room is usually situated in the basement or sub-basement in close proximity to the dispatch docks; its equipment generally consists of a large revolving table on to which the chutes deliver the packages and from this table the goods are picked off, registered on the van delivery sheets and put into baskets or trolleys which are assembled in the dispatch room for transport to the vans themselves, or passed into a posting department. The dispatch itself is by means of loading docks, where vans for each district collect their own goods, or in congested districts, where vans cannot wait satisfactorily, the goods are taken in bulk to another building in a less congested area, where they are sorted for delivery by the ordinary vans. All the rooms in the dispatch section vary in size according to the type of business in each store, as the amount of delivery of goods varies considerably. Very special precautions should be taken to guard against fire in packing rooms where quantities of very inflammable materials such as paper and wood-wool are used. Fire is apt to spread up chutes and these should have adequate fire doors (gravity acting with fusible links) provided at suitable points in their run.

Cash—The method of handling cash affects planning to some extent. The systems may be divided roughly into two types: cash registers in each section or pneumatic tubes or some similar conveyance to centralised cash stations. The latter system has the disadvantage of being somewhat slow in operation, but if it is adopted, a cash department is needed in a central position in the building, but near to the floors having the most transactions, generally the ground floor. The tubes may be placed in floors or ceilings, as they are generally about $2\frac{1}{4}$ in. in diameter, and require a space of about 4 in. in addition to structural necessities. Pneumatic tubes are often installed, not only for the handling of cash, but for communication between departments, sending of orders, invoices and general management; considerable time is saved over that occupied by messengers carrying the necessary papers.

Selling Counters—The arrangement of space for selling varies considerably in each department, and no hard-and-fast rules can be given for the lay-outs, except where there are a number of departments selling various smaller articles (almost always placed on ground floors and in basements). These can be dealt with in multiple unit fittings, designed mainly as islands, as shown in Figure 10, in conjunction with the typical column spacing of the shop. These fittings generally consist either of a central fitting about 6 ft 6 in high surrounded by counters which form showcases about 3 ft 3 in high above the floor, or, more simply, two counters with a serving space between them. Aisle widths should not be less than 8 ft when there are serving counters on both sides, but may be reduced to about 5 ft 6 in when counters are on one side only.

The width of aisles is dependent on the space required for serving, and at least 20 in should be allowed for customers standing at counters; it is generally wise to round all

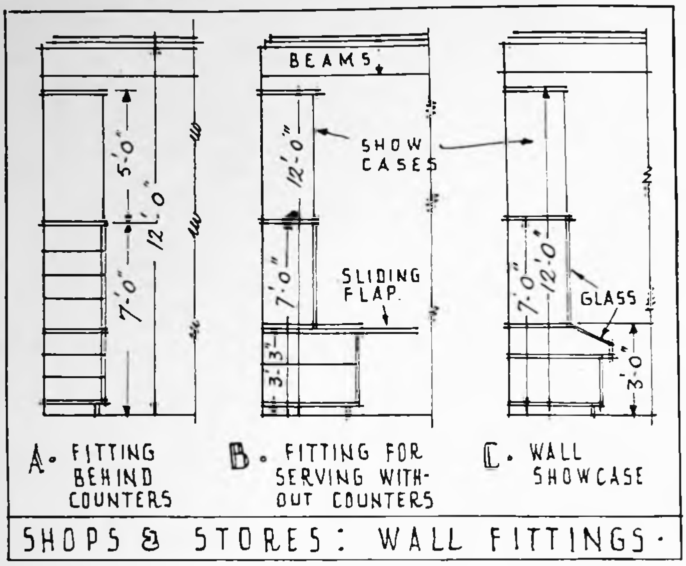


Figure 11

corners at intersections. Island showcases should not be placed on main aisles unless the latter are of greater width than 10 ft, and there should be no " bargain " tables in aisles of less width than 12 ft.

The tall stock or back fixture varies in depth from about 18 in to 33 in, with a preference for narrower widths, even if long rolls of material have to be placed in them sideways. In these back fittings may be placed cash registers, tube stations for cash or messages, wrapping-tables, etc. Counters are generally about 3 ft 3 in high, and variations depend on whether customers are likely to sit or stand when making purchases. The space between the back fitting and the counter must be at least 2 ft and preferably rather more and care must be taken in detailing drawers, trays, and cupboard doors, so that all fittings may open easily into this space. Counters vary in width from 18 in to 30 in, but about 24 in is the most general. The actual design of the fittings to receive the various types of goods has, to a large extent, been standardised in practice by the many firms of shopfitters and as the details for each trade vary so much, the information is beyond the scope of this book. Often the floor of the space between the counters and the back fittings is raised about 4 in. in order to raise the salesman a little above the customer and also to provide a more comfortable floor material on which to stand for long periods than that generally used for the floor of the public space. Wall fittings are used either to divide departments or are placed on the perimeters of selling spaces; they are generally about 6 ft 6 in or 7 ft high, with showcases 2 ft to 6 ft high above, bringing the total height up to a maximum of 12 ft. It has been found that 6 ft is about the highest, that the average salesman can reach without steps. Figure 11 shows three typical sections of wall fittings. Type A is for use behind counters and is fitted up similarly to the back fixtures used in the island groups. Type B is for use without a counter, but a draw-out flap or shelf is provided for this purpose. Type C is a wall fitting for use without counters and is mainly for display purposes only. These fittings are not generally taken to the full height of the shop because (especially large totally enclosed showcases) they are not adequately protected by the sprinkler system and also it is generally convenient to have ventilation outlet grilles above the fittings, and because it is also troublesome to fit the fixtures between the ceiling beams.

The lay-out of upper floors and of departments where multiple unit fittings do not apply is generally fixed by apportioning a number of bays of the column spacing to each trade, and separating them either by aisles or tall fixtures. The fittings are generally special for each department, some of which display only a very small amount of their stock, as in the case of ladies' clothes, where most of the stock is placed in stockrooms adjoining the main selling spaces, which may then be arranged with tables and easy-chairs to give a more comfortable impression than can be provided in rooms surrounded by counters. On upper floors where the floor space itself is used for selling, the aisles are generally wider.

Fitting Rooms—These should be attractive in appearance, easily accessible from the main showroom and not less than 6 ft 6 in by 6 ft 6 in. They should have partition walls at least 7 ft high and are better if ceiled to preclude the overhearing of conversation between the rooms. Carefully considered lighting and ventilation are essential, as well as complete equipment, such as properly placed mirrors.

Restaurants—Many store buildings have a restaurant for the use of customers and soda fountains and quick-lunch counters are sometimes provided as well. The restaurants are usually placed on top floors, partly on account of light and ventilation, partly to avoid the risk of kitchen odours penetrating to the selling areas and also because floor space is less valuable for selling purposes than on lower floors. One kitchen can generally be made to serve both the customers and the staff canteen. Occasionally soda fountains and quick-lunch counters are placed in less important areas of the main selling floors fairly near to the street level. It is desirable to have the kitchen on the same floc and adjoining the restaurant. The number of restaurant customers is very difficult to gauge and the floor space required is usually settled by other factors, such as using a whole floor or wing for the restaurants, kitchen and a few rooms, such as toilet and rest rooms. The restaurant and such other arrangements as are provided for catering are often regarded rather as a convenience and attraction to customers, than as producers of profits and, therefore,

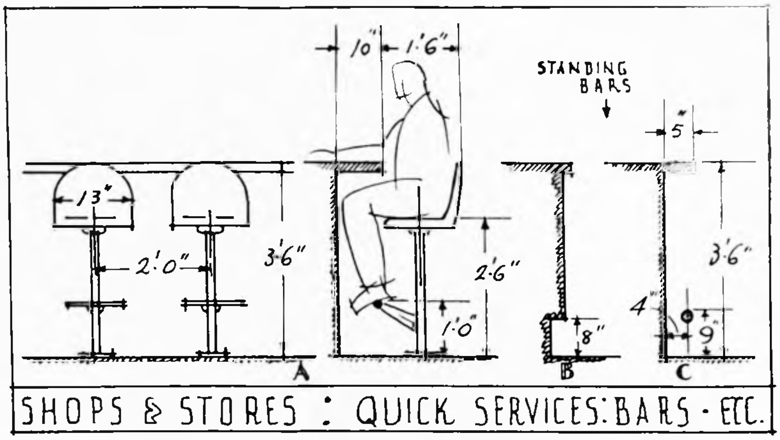


Figure 12

being of less importance than selling space for goods, should be planned accordingly. The sizes and spacing of seating and tables for restaurants are fully discussed and illustrated in the section on "Hotels."

There has been a tendency for the soda fountain and quick-lunch counter to be increasingly used in some classes of shop buildings, and much less floor space is needed for service and preparation than for ordinary table service. The cafeteria, or self-service-counter type of restaurant saves in kitchen and service space, but the tables occupy the same area as an ordinary restaurant. Both these methods of catering quicken service to the customer and by saving labour and floor space make possible somewhat lower prices. It is probable that all forms of counter seating are more economical from the store-owner's point of view, as there is less tendency for customers to sit gossiping than when seated at tables; against this, however, there is the disadvantage that if the food service is to be an attraction, counter methods may be unpopular with customers.

Counters may be of two general heights, for use either with low seats about normal chair height, or with high stools or chairs. The latter are more general in this country, although the former are being increasingly installed in America; in the case of the low-seat type, the floor behind the counter should be sunk below the level of the floor on which the customers sit, to avoid unnecessary bending on the part of the waiters. Seats at counters should be placed at least 2 ft apart, and be 2 ft 6 in above the floor when the high type is adopted, in which case the counter should be 3 ft 6 in above the floor, as shown in Figure 12. It is desirable to provide backs to the seats, and also foot rests, as persons should sit on high seats or stools in a similar attitude to that adopted at a table. Low-type counters should be 2 ft 6 in above the floor, and the seats 1 ft 6 in high. In some Continental restaurants high seats have been designed to fold back against the counter front, so that customers may stand at the counter if they prefer it. Counters for consumption of food only (that is, without service equipment forming a part of them) generally vary in width from 1 ft 4 in to 1 ft 8 in, and need 3 ft 8 in to 4 ft width behind them for service space. If a soda fountain or similar fixture is incorporated with the counter, the width occupied is about 3 ft, with the counter top itself projecting a further 6 in. Soda fountain and sandwich counter units average about 10 ft to 12 ft in length.

Public Service Rooms—Toilet facilities for customers of both sexes should be provided in all large shops and stores; greater provision is required for females than for males in ordinary stores, as the proportion of male customers is generally smaller. It is usually best to plan toilet rooms near the restaurant, if there is one, but they should always be grouped together in one place, rather than providing facilities on several floors. It is general to provide a rest room for female customers in conjunction with the toilet rooms and this room generally has facilities for seating a number of persons at one time and also for writing. The toilet rooms should be divided into separate rooms, one for use as a cloakroom where clothes and parcels may be left, another for the lavatory, with ample basins, powder tables and mirrors and a third for the W.C.s. It is important that these rooms should be made as pleasant, attractive and comfortable as possible, at the same time bearing in mind in choosing materials that they are constantly used by very large numbers of people, which makes for very heavy wear and tear on the equipment.

Children's Room—Occasionally, to relieve parents of the difficulty of looking after children while shopping, a children's playroom, fitted with many toys, such as slides, as well as ordinary loose toys, is provided, with a nurse in charge. This is useful for shoppers, but is non-revenue producing and can only be placed in a position of little value for selling purposes.

Hairdressing Departments—Hairdressing departments for men and women are generally separated, though occasionally they share a common waiting-room. These rooms are usually placed on upper floors, as customers do not, as a rule, decide casually to go to the hairdresser; in some shops the basement is used. The women's department generally consists of a large open space, around which are the actual working cubicles, while the centre part of the space serves as waiting-room and sales space for goods, such as scents and beauty preparations. In this space also should be placed the cashier's desk and appointment bureau. A special room for children is often attached to the women's department and this is generally a large open room with several barbers' chairs. The cubicles are usually about 6 ft 3 in wide, and should be at least 7 ft deep, preferably more, with partitions at least 7 ft high on the sides and either a similar partition with a door, or sometimes only a curtain at the back. Figure 13 illustrates a typical cubicle for ladies

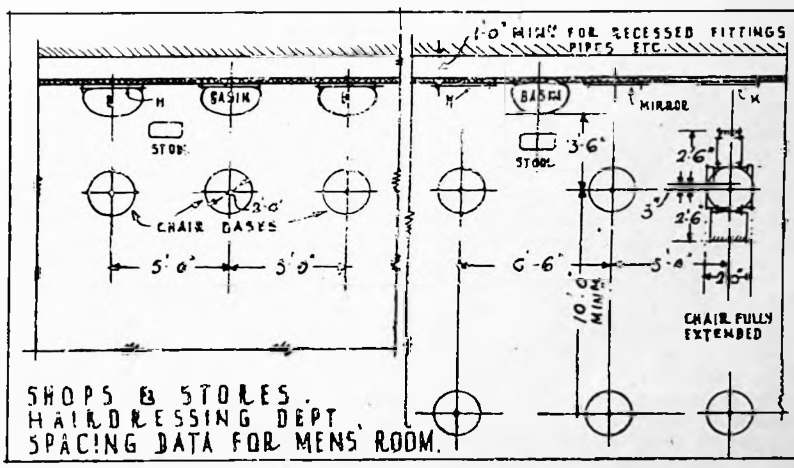


Figure 14

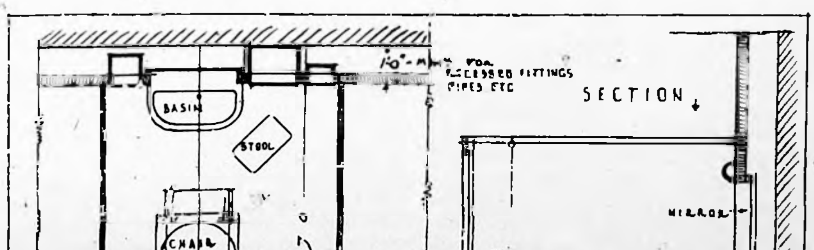


Figure 13

tion is provided numerous outlets should be placed in these departments for the rapid cleaning of the floor.

Administrative Department — Except for small departmental offices, which are generally placed on each floor, the offices and other rooms for administration purposes are generally placed at the top of the building, where space is least valuable. The public does not as a rule need to go to the offices, except for certain purposes such as arranging accounts, correction of errors and general information, for which purposes a separate office is frequently provided on a lower floor. The main sections of the offices are the directorate, secretariat, bought-and-sold ledger and post departments, advertising, telephone exchange and maintenance. They should all be close together for easy supervision, but their relative sizes vary considerably according to the type of trade handled in each store.

Staff Rooms — Employees should have their own entrance, entirely separate from customers' entrances. It should have an office for supervision, near which are often placed offices for the staff and employment managers. Staircases should lead directly from the entrance to the locker rooms, which are generally placed in the basement and are therefore artificially lighted and ventilated. All members of the staff should have a separate locker in which to keep their clothes. Many of the employees change their clothes on arrival, and locker rooms should provide enough space for this purpose. Figure 15 illustrates typical sizes and spacing of locker rooms ; lockers are made in various sizes, but a good average size for the constant storage of indoor or outdoor clothes is 1 ft 3 in square, and about 6 ft 6 in high, to give space for hats above, and shoes below hanging clothes. Diagrams B and C illustrate the minimum spacing between rows of lockers ; diagram B provides a central circulation space which is needed if many lockers are placed in a row. The lockers are generally of metal, should have ample ventilation and be raised a little above the floor level both to allow air to circulate through them and for easy cleaning.

Staff lavatories are sometimes placed together on one floor, generally the basement, but it is more usual to place them on each floor and arrange approach from the service staircases in order to reduce noise ; the latter placing saves employees' time and considerable traffic on staircases and in lifts. In many stores the number of female staff often greatly exceeds that of the males and therefore on many floors provision is not made for male staff toilet rooms, which are placed on alternate floors, or only on the top and lowest floors. The number of W.C.s required by the Factory and Workshops Act is one for every

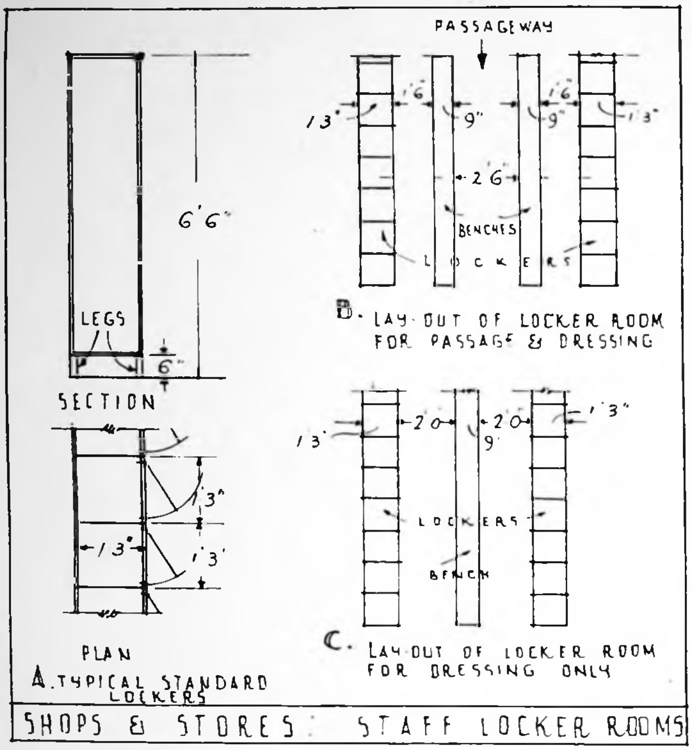


Figure 15

with its average dimensions. The main fixed equipment is the chair itself and a large lavatory basin with mirrors and shelves round it.

A men's department usually has the chairs placed in a large room, and not in cubicles, except for one or two set aside for chiropody. The basins are placed round the perimeter of the room, with the chairs placed opposite to or between them, the latter allowing larger mirrors to be used. Figure 14 illustrates the average spacing required for the chairs and the amount of space needed between them. It will be seen that the chairs may be placed closer together when each has its own basin, but the spacing has to be increased if the basins are placed between the chairs ; in the latter arrangement frequently only one basin is provided between two chairs and then also alternate chairs only need the wider spacing. If chairs are placed on both sides of a room, at least 10 ft should be allowed from centre to centre of the chairs to permit circulation when they are used in a reclining position and fully extended. The placing of the basin between two chairs also allows more space for shampooing.

Waiting space is required, and is most satisfactory if arranged as a separate room, rather than by placing chairs in the main room ; in this waiting-room may be the cashier, appointment clerk, sales stalls and also a cloakroom where coats and hats may be left, which is more satisfactory than simply providing hat and coat-stands in the barber's room itself.

Changing rooms with bathrooms are frequently attached to men's hairdressing departments, and should have an area of about 60 sq. ft. ; two changing rooms may conveniently share one bathroom if a basin is placed in each changing room.

Daylight is not necessary for hairdressing departments, but well arranged artificial light is essential both to light the customer's head and the mirrors. A room is required for the staff to use for changing and waiting between serving customers ; it should contain lockers for each member of the staff and lavatory basins. Rooms are also needed for sterilising brushes, combs, towels, etc., and for mixing washes and lotions. The former should be equipped with a small steriliser and a sink with ample draining-board space ; the latter needs cupboards for storage of bottles and a long bench with plenty of shelving above. The plumbing and services required are considerable and it is therefore wise to plan an access passageway, in which all services may be placed, immediately behind the wall to which the basins are fixed. This passageway is also often used for the collection of dirty towels, etc., from containers placed near the basins. Each chair requires compressed air and electricity as well as hot and cold water. Towel heaters are also needed, which may be heated by steam when available, otherwise by gas or electricity. To avoid breakdowns and heavy maintenance charges, very good quality equipment and installation of services are of extreme importance. If a central vacuum cleaning installa-

twenty-five females ; for males, one for every twenty-five up to one hundred, and one for every forty thereafter ; in buildings of the store type, it is, however, general to provide more than this number and a basis of one W.C. to every fifteen persons is more satisfactory. Lavatory basins should be provided in about similar proportion. Natural light and ventilation are desirable in lavatories.

Shop Fronts—Shop fronts are very carefully governed by building regulations, particularly in the London area, where the whole façade of a building is subject to a regulation that the total area of the openings above the ground story must not exceed one half of the total area of the wall : it is not stated, however, that the openings may not be continuous glass bands, either horizontal or vertical. In streets of a width not greater than 30 ft, as shown in Figure 16 A, shop fronts may not project beyond the external wall of the building more

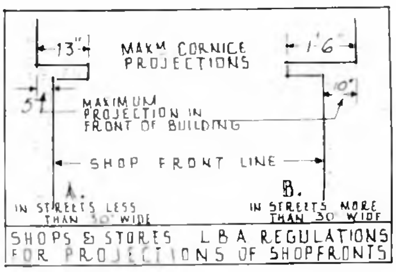


Figure 16

than 5 in, and cornices to such shop fronts not more than 13 in ; in streets of greater widths than 30 ft, as shown in Figure 16 B, shop fronts may project up to 10 in, and their cornices up to 18 in beyond the external wall ; in either case no part of the shop front (except the cornice) must project over the public way or any land to be given up to public way. In London, as shown in Figure 17 B, no part of the woodwork of any shop front may be fixed higher than 25 ft above the level of the pavement. No part of the woodwork shall be fixed nearer than 4 in to the centre of the party wall or nearer than 4 in to the face of the wall of the adjoining premises when there is not a party wall, unless a pier or corbel of incombustible material at least 4 in wide is placed as high as such woodwork and projects one inch at least in front thereof between such woodwork and the centre of the party wall, or the separate wall, as the case may be. It is important that adequate provision be made for the removal of water from cornices or projections over shop fronts to prevent dripping on to the public way.

Figure 18 illustrates eight typical shop-front plans, each with entrances of various types, four of which, Diagrams A to D, are deeply recessed, thus having large areas of display window ; the others, Diagrams E to H, are only slightly recessed. All the types shown are for single shops between party or external walls, but they may be used in conjunction with other windows if desired. Type A shows a wide entrance leading to two separate doors divided by a showcase, but it has the fault that persons cannot stand and look into the central showcase without blocking the entrance doors ; the side display windows are shallow and, therefore, not suitable for all trades and they are also slightly splayed on the frontage to give a directional feeling towards the entrance. Type B is somewhat similar to A, but the central showcase is placed on the frontage and only one large doorway is provided to the shop itself ; the show windows are slightly larger, but the approach is cramped. Types C and D each have a small shop entrance door placed to one side, thus permitting more show window space in the former example and one very large window in the latter. Type C allows plenty of circulation room for those wishing to look into the windows. Of the shallow recessed types, Example E has a central entrance with splayed windows on each side, whereas Type F places the entrance to one side but still uses the splay to direct towards the door to the shop. Type G has only two comparatively small show windows, but has additional windows on each side of the shop door, which tend to make the whole shop a display. Type H provides the maximum of display which can be obtained in the shallow recessed types.

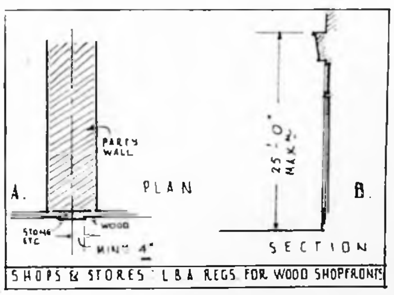


Figure 17

Figure 19 illustrates two examples of arcaded shop fronts ; these restrict the amount of ground-floor space available for the shop itself, but provide a greatly increased area of display windows and cases, frequently desired by shopkeepers. Type B may be slightly better than the other as the actual shop entrance is more easily visible to passers-by. In all these types of shop entrances and deeply recessed entrances, provision must be made for closing them at the frontage line at night-time. Care should be taken in using the arcade type of shop front not to make the passageways for customers so narrow that intending customers are unable to pass those looking into windows. It should also be borne in mind that artificial light is always needed for the back parts of the arcade, as daylight cannot always penetrate satisfactorily, particularly when showcases are standing near the entrance. Glass curved on plan is not very satisfactory owing to the difficulty of seeing the contents of the window due to reflections.

Figure 20 illustrates four typical sections through shop fronts ; these examples summarise the essential points in connection with the placing

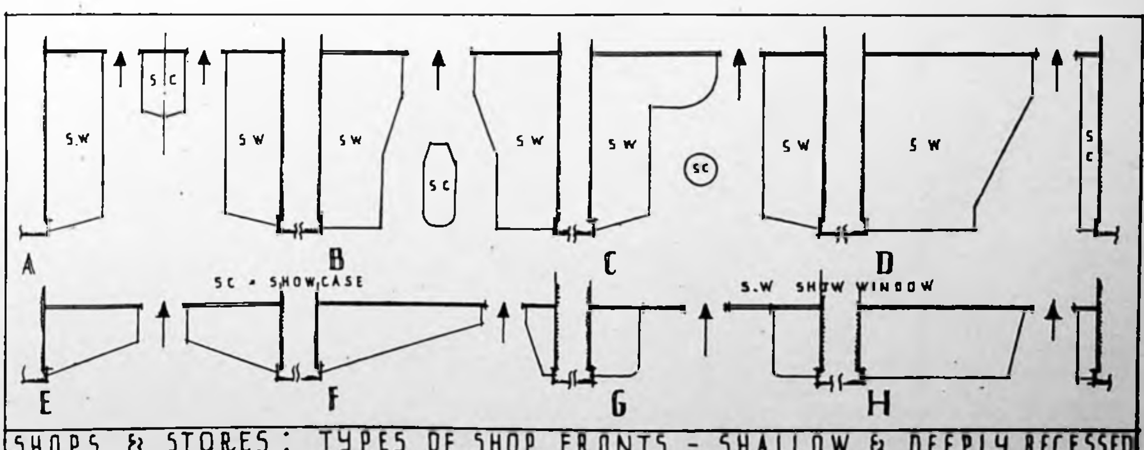


Figure 18

of fascias, blinds, transomes and stall-boards. Shop windows may be roughly divided into two main types, those with a permanent background and those without; in the latter a full view of the shop is available from the pavement and this increases the display area, but its use is, of course, limited to certain trades only. Backgrounds, when used, may be permanent, in the form of walls or panelling; or are sometimes only temporary or movable screens; these backgrounds sometimes extend the full height of the shop, as in Diagrams A and B, or they may be stopped by forming a ceiling at a transome height as in Diagrams C and D, which permits either the lighting of the shop by clerestory means or the use of the upper portion of the shop front for display purposes, lettering and artificial illumination. The level of the floor of the shop window in relation to the pavement varies very much, mainly according to the type of trade; sometimes it is level with the pavement itself, but more frequently raised above it from a minimum stall-board height of 6 in up to as much as 3 ft 6 in, the average being about 1 ft 4 in. Generally speaking, the higher types are used for articles such as jewellery and are not of a great depth. Where really deep windows are required it is necessary that the floor level be not raised much as goods are hard to see when placed towards the back, except when the window floor and the pavement are level. Ventilation may be provided by means of the stall-boards to the basement, as suggested in Figure 20. The window floors are usually flat, but occasionally they are slightly inclined towards the pavement as shown in Diagram B. The lowest point of the glass of the window should be at least 6 in above the outside pavement and preferably rather more, and transomes may satisfactorily be placed about 9 ft 6 in above the pavement, at which level the ceiling may be formed as in Diagrams C and D, but if the windows are deep, greater height is desirable to ensure adequate light on objects near the background.

Sunblinds are essential for most trades if the aspect is such that goods displayed in the windows may be damaged by direct sunlight at some time during the day. The position of name fascias above or below blinds has not been agreed except by using both positions; if the name is above the blind, persons on the pavement cannot read it and if below, those on buses or trams cannot see when the blind is down. It is essential to have easy access by large doors to shop windows to facilitate the handling of large objects to be displayed in them, particularly furniture, screens and display equipment. The lighting of shop windows must be carefully considered in connection with their design so that the necessary fittings may be incorporated in the scheme and not have the appearance of an afterthought. The diagrams in Figure 20 show various common types of lighting for shop windows, but in addition to the lights at the top of the windows others are frequently placed on the floor level and shielded by name plates or continuous reflectors.

Figure 21 illustrates the placing of the glass line of display windows in store and large shop buildings in relation to the building line. Type A is the normal position where the glass is approximately flush or very slightly set back from the building line. Type B shows the projecting type (as permitted by the L.C.C.), which wastes space on all the upper floors but allows a continuous shop window, if desired. Type C, semi-arcaded, gives some protection both from weather and passers-by to those looking at the window displays and also presents a window face more or less directly in front of those approaching in either direction, a point of considerable value. Types D, E, and F are variations of the arcaded type, in which the actual display window is set back from the frontage in order to allow shoppers to look at the goods displayed without interrupting the normal traffic on the pavement and allowing them to be under cover in wet weather. Types E and F have the advantage of being more noticed and attractive to passers-by than the flat Type D, particularly Type F, which is also useful as a direction indicator towards the entrances. There is still a great variance of opinion as to whether the windows should be continuous or divided into bays by fairly substantial

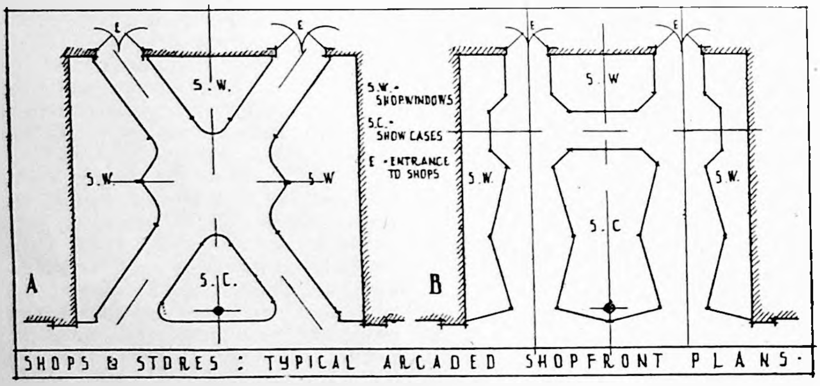


Figure 19

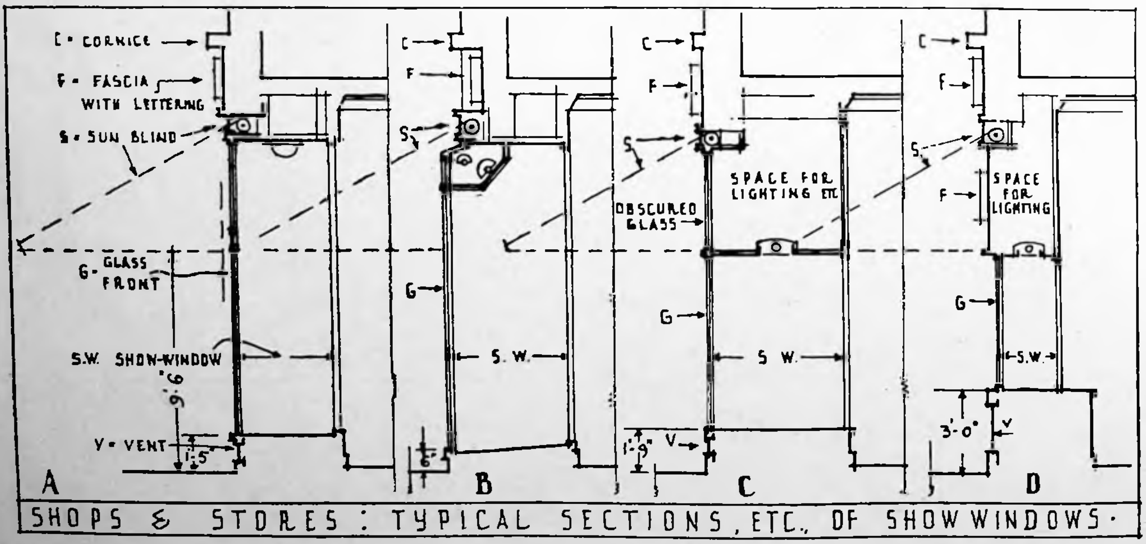


Figure 20

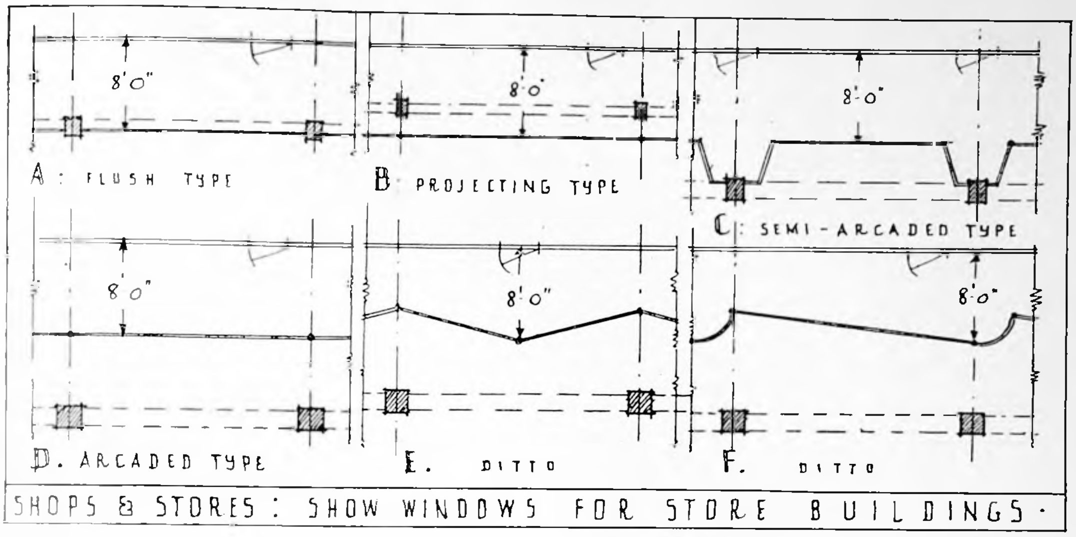


Figure 21

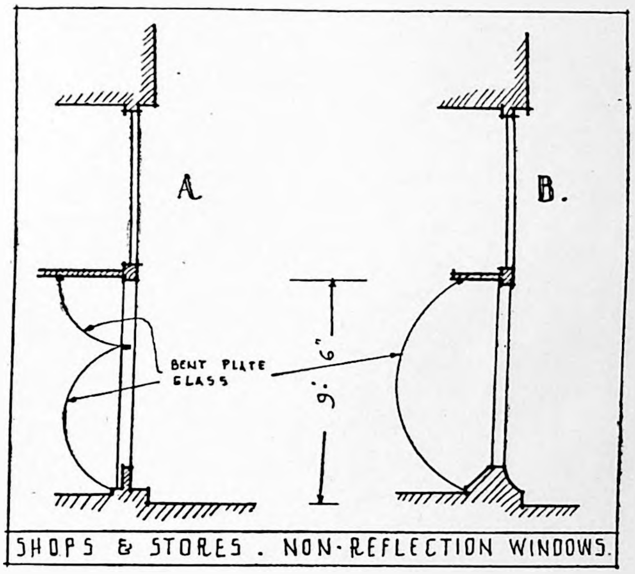


Figure 22

piers ; it appears that to some extent it is dependent on the type of trade for which each store is intended ; on the whole, however, it seems that separate windows are more satisfactory when varied window dressing and displays are required for different departments. Windows about 15 to 17 ft wide seem the most satisfactory, and these may be planned very conveniently with a 20 to 22 ft column spacing of the structural planning. Windows vary in depth from 2 to 12 or even 15 ft, but the average is about 8 ft, except for the exhibition of large articles such as furniture, when about 12 ft is desirable. One factor which should be borne in mind in designing these windows is the maximum normal commercial sizes of plate glass, which are : for $\frac{1}{4}$-in thickness, 165 in by 110 in ; for $\frac{5}{16}$-in thickness, 180 in by 130 in ; and for $\frac{3}{8}$-in, 280 in by 120 in. Larger sizes up to 288 in by 168 in ($\frac{3}{8}$-in thick) can be obtained by giving special notice to the manufacturers.

One of the problems in regard to shop windows is the reflection of objects in or across the streets, which makes it difficult to see the goods on exhibition. Deeply recessed show windows are particularly liable to this fault. Several ideas have been put forward to overcome the trouble, most of which are based on the principle of curving the glass parabolically, shown sectionally in Figure 22 ; by curving the glass in this way, the rays of the light falling upon the surface of the glass are reflected away from the eye.

Signs, etc—In the L.C.C. and some other areas there are definite regulations governing signs, The L.C.C. requirements are summarised in the following paragraph which may also serve as a general guide to other districts.

Signs, or structures supporting them, must not be fixed less than 8 ft clear above the pavement, nor must they be nearer the carriageway than 2 ft 6 in from the outer edge of the kerb, nor may they project more than 4 ft from the wall or shop front. If they extend more than 2 ft along the face of the building, then 2 ft is the maximum projection allowed ; signs shall not be more than 2 ft 6 in in height nor extend more than 6 ft in any direction. Seven days' notice is required by the L.C.C. before fixing any lamp, sign, or similar structure. Figure 23 C summarises the main provisions of these clauses. The regulations require that lamps and structures overhanging the public way shall be at least 8 ft clear above the footway and not nearer the kerb than 2 ft 6 in, nor projecting more than 5 ft from the front of the premises to which it is attached, as shown in Figure 23 B. Lamps must not exceed 3 ft in any part, measured horizontally over all, nor must their weight exceed 84 lb, and they must have a secondary means of support. There are, however, various exemptions to the foregoing clauses, particularly with regard to lamps, which may be fixed 7 ft 6 in. in the clear above the pavement, not projecting more than 3 ft beyond the line of the window frame and not nearer than 2 ft 6 in to the outside of the kerb, so long as it is used solely for the purpose of illuminating such windows from without. The lamp itself is not to exceed 36 in. in height, 24 in. in width parallel to the face of the building, and 24 in. in depth, from front to back in the clear, as shown in Figure 23A. There is a clause that the L.C.C., after consultation with the local authority, may in any case in which it may consider it expedient so to do, dispense with the observance of any of these by-laws. These regulations do not apply within the City of London.

Blinds—Blinds are also controlled in many districts by regulations ; the L.C.C. require that any movable sun-

blind, its stays or fittings, excepting the valances or side blinds overhanging the public way, shall not, when open, be below an imaginary line drawn from a point 7 ft above the pavement at a point 2 ft from the outer edge of the kerb to a point 7 ft 6 in above the footway adjoining the front of the shop. These dimensions are illustrated in Figure 24.

Marquises—The L.C.C. Regulations now allow the provision of continuous marquises or canopies over shops irrespective of whether the shops contain within their walls restaurants or other places of public resort.

Although there is no specific wording in the L.B. Acts, to authorise such structures, special application can be made under Section 79 of the Act. In connection with any such application it should be noted that (a) no supports will be allowed from the footpath (as has sometimes been allowed heretofor); this implies a cantilever design. (b) The whole structure must be constructed of fire-resisting materials. (c) The projection over the public footpath is governed by the widths of the footpaths and the streets ; for example, in a street 40 ft wide and over, the projection of the canopy may not be nearer to the edge of the kerb than 2 ft 6 in, or in a 30 ft wide street this distance may be required to be increased to 3 ft. Such allowances are judged upon application, on the merits of the particular case. (d) Some provision for artificial lighting must be made in the soffits of the canopies (it is possible, however, that under certain circumstances, this requirement may be waived).

It should be noted in connection with continuous marquises that in consequence of the height above the pavement and the low type of stallboard to shop windows now in vogue, some provision may have to be made for blinds of the roller type to drop vertically near the extreme outer face of the canopy to protect the lower parts of the windows from sun in particularly exposed positions. In such cases, the ordinary regulations governing the height and projection sunblinds come into operation.

Sky Signs—The L.C.C. define a sky sign as something silhouetted against the sky and not having a solid background. Flag poles, vanes, or weathercocks are exempted, if free from advertisement. Sky signs are not permitted by the L.C.C., but elsewhere local regulations vary on this matter.

Entrances to Floors Over Shops—The design of entrances for access to upper floors needs special consideration, particularly if lettings are separate from the shop. If the shop occupies the upper floors, a separate entrance may not be needed at all and in any case the approach may be inside the display windows as shown in Figure 25 A ; but this plan is unsuitable for independent letting, as tenants may want to use the premises after the normal hour for closing the public space to the recessed shop front, which would necessitate each tenant having a key to the gate or having a porter on duty. The arrangement shown in Diagram B, where the shop and upper floors are approached from a combined entrance, has the same objections as Type A, except that the entrance to the upper floors is more open and more easy to find than Type A, where visitors to the upper floors might never find the entrance. The most satisfactory solutions appear to be based on completely separate entrances to both the shop and the upper floors, as in Diagram C, although this has the difficulty of treating two similar entrances in different ways in order to prevent confusion, an effort of design not easy to achieve satisfactorily.

Figure 25, Diagram A, also illustrates a means of providing back access to shop windows ; back access is generally desirable for all windows, but is often somewhat difficult to provide when the windows are in rather isolated positions. Island showcases require access through doors built as part of the cases themselves, which is much more difficult to arrange in larger windows.

Arcades — Arcade developments are frequently used in connection with deep sites which, owing to their cost, need a greater amount of development than can be provided by building up the frontages alone. The shops in these arcades are generally small and of the "lock-up" type ; back access is seldom provided, nor is it generally possible to make such provision even if desired. It is common to provide this type of shop with a mezzanine floor approached by a very small internal staircase in each unit, as shown in Figure 26 A ; these mezzanine floors raise the height of the arcade and therefore improve the

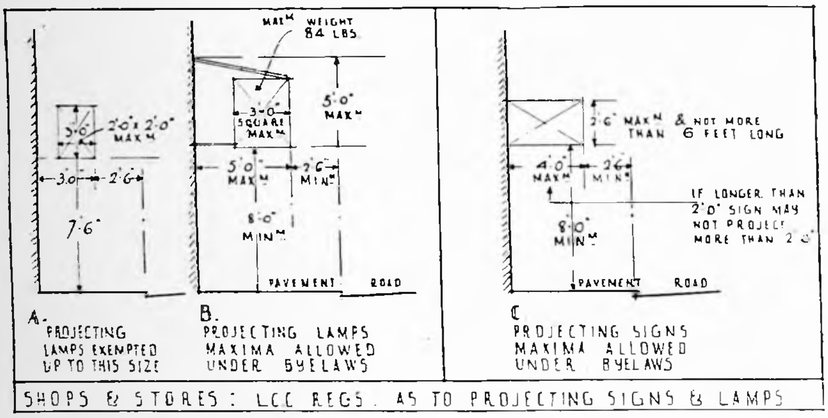


Figure 23

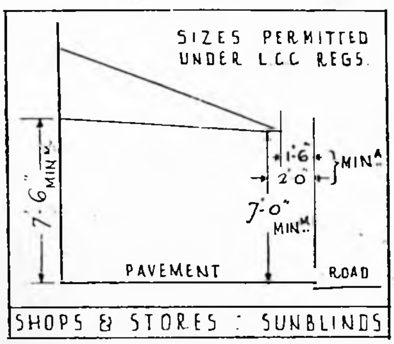


Figure 24

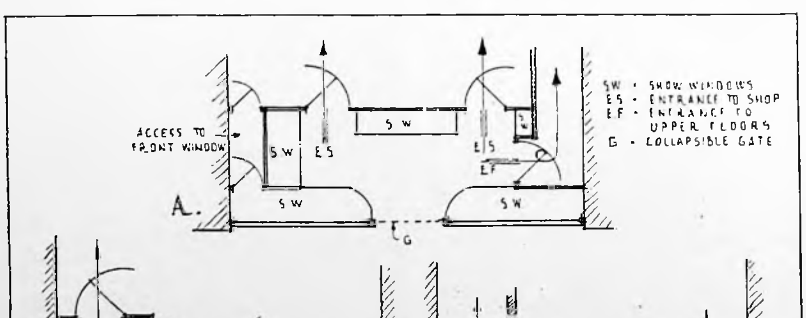
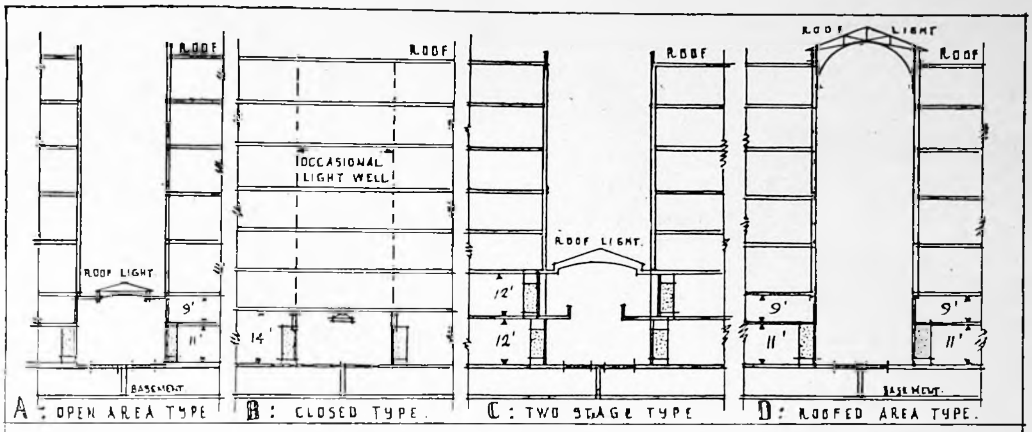


Figure 25



SHOPS & STORES : TYPES OF SECTION FOR SHOPPING ARCADES.

Figure 26

lighting and ventilation. The shops are generally based on a small frontage unit of about 12 ft to 15 ft, sometimes as small as 10 ft, the heights allowed are usually about 11 ft or 12 ft in the clear for the ground floor and about 9 ft for the mezzanine. The width of the arcade itself between the shop fronts must vary according to the length, but the minimum width should not be less than 12 ft, while rather more is desirable to overcome any feeling of congestion, for it must be remembered that most arcades are used as a passageway as well as for shopping. Arcades should be open at both ends and should also connect to main streets at both ends and it should be borne in mind that arcades largely depend for rental value on the number of people using them as a means of communication. Arcades are generally closed at night on the frontage line of each approach street. They must be well lighted artificially because their position does not usually permit adequate day lighting except in very bright weather and very often they have no daylight whatsoever. They usually depend on the through passage of air from the ends for their ventilation if they are short, but when long, some top ventilation is essential, at least at intervals in their length, and this may often be provided through the internal lighting wells or areas of the buildings above, as shown in Figure 26, Diagram B. Figure 26 illustrates four typical sections through arcades placed in large blocks of buildings. It is a great convenience to have basement storage spaces available for each shop and this can easily be provided underneath the arcade itself, as shown in the diagrams. The section illustrated in Diagram A is for use when there is a long open area available in the upper part of the building which permits of constant and adequate daylight being provided to the arcade itself ; whereas Type B shows an example which depends on artificial light, with, perhaps, small light wells at intervals in its length, but normally the whole is built over above the arcade. Type C is an example where shops are placed on two levels, the upper one being served by balconies. These balconies should be at least 8 ft, and are better 10 ft or even 12 ft wide ; staircase approaches to upper floors are needed near each end, and, if the arcade is long, at intermediate positions, in each case being about 4 ft 6 in wide and placed between shops on the ground-floor level. Type D is frequently used abroad ; it is roofed with glass at the top of the main building, and has the windows of upper floors overlooking the arcade ; it has the advantage of greater air space and consequent better ventilation, but there is an increased risk of fire in connection with the upper floors. An important consideration in the planning of arcades is the sanitary accommodation for use of the shop staffs ; it is generally impossible to provide the necessary accommodation to each shop owing to the difficulty of obtaining the necessary ventilation areas, although this might be overcome now that mechanical ventilation is approved in some districts ; but the usual practice is to provide grouped accommodation for each sex at some convenient position in the arcade, placed behind the shops and approached between two of them, or to place the groups in the basement in some situation where ventilation is possible by continuing upper-floor light wells down to basement or ground-floor level. It is important that the sanitary accommodation be placed in some unobtrusive position to avoid its use by the public.

Small Suburban Shops—The data previously given applies in the main to suburban shops, but there are also a few special considerations, such as the parking of customers' cars, for which provision can be made in new suburban developments which, owing to the value of the sites, are impossible in urban schemes. Suburban shop schemes do not generally make any provision for the parking of cars except by leaving them in front of the shops themselves, where they impede the normal traffic of the street and the deliveries to and from the shops. In all new development schemes proper provision should be made for cars, as customers are more likely to deal with shops where they can leave their cars and it is therefore an added advertising feature. Figure 27 shows methods of development which provide adequate parking facilities off the main road and is in two parts, showing the scheme applied to corner sites and normal straight frontages and also a combination of the two. The scheme is achieved by grouping a number of small shops round an open paved space, which must be large enough for the easy handling of vehicles. In the combined scheme, as illustrated, provision is also made for the handling of trade vans in the rear part of the site behind the shops, where it is screened from view, and does not interrupt the front or customers' entrances to the shops, as so frequently happens. The corner treatment is not only useful in dealing with the parking problem, but, owing to the opening up at the junction of the roads, traffic from the side has a better view of the main road. It should also be noticed that these schemes provide a greater amount of main-road shop frontage and consequent increase in value, although greater land area is needed ; but length of shop frontage is generally of greater value than land area in such situations.

Back access to suburban shops is really essential and by its provision accommodation may frequently be arranged for the garaging of vans and storage of empty packing cases. Sites should, therefore, where possible, be chosen of sufficient depth to accommodate both the shops and the necessary yard space at the back (or sides) of the shops.

The size of the suburban type of shop varies considerably, the frontages being from 10 to 25 ft wide, with an average of about 16 ft, a size which seems to make subdivision into two shops impossible, a practice that is detrimental to the value of the surrounding shops. Narrow shops are

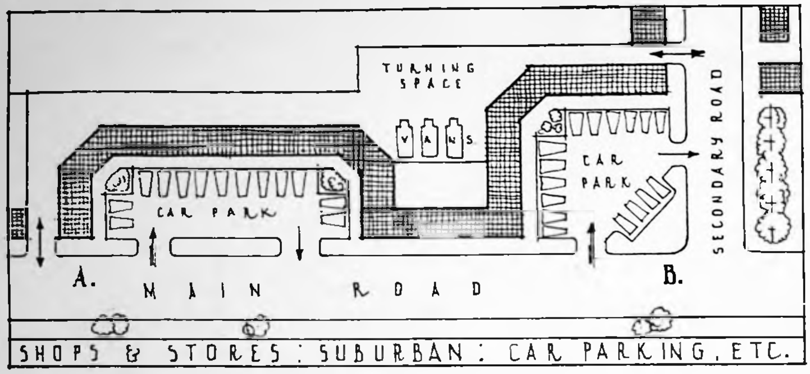
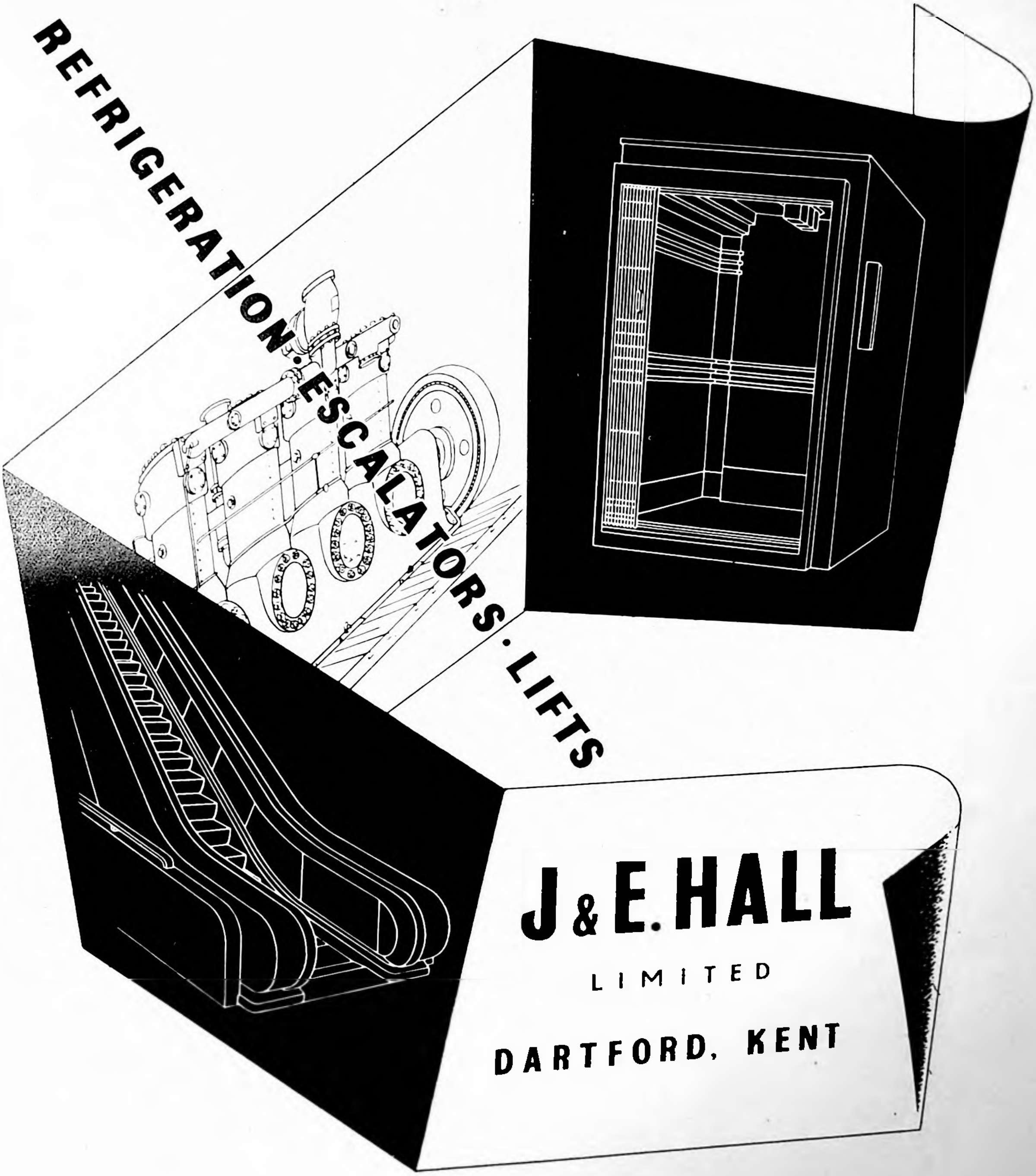


Figure 27

often wanted for certain trades, but, on a whole, it seems advisable to separate schemes having varying sizes of shop. Depths vary from about 30 ft to 60 ft, with an average of about 45 ft on the ground floor. The upper floors, which are sometimes used as show- or store-rooms, but more generally as flats, are usually of shallower depth, thus permitting lantern or pavement lights for providing top daylight to the back part of the shop. It is desirable also to place windows in the rear wall of the shop where possible. Basements for storage purposes are not frequently provided, as their cost does not seem to be justified by the increased rental obtained. If the upper floors are used in connection with the shops themselves, direct access is usually provided by means of staircases against one side; but when they are used for living accommodation, the access is usually external, as the flats are frequently let separately by the tenants of the shops. Methods of access to flats over shops were discussed in the section on "Flats." Sanitary accommodation should be provided in each shop, and should take the form of lavatories and separate W.C.s, which are sometimes placed in the rear part of the shops themselves, and approached from a small lobby, or the lavatory itself forms the lobby, or they may be placed outside the shop against the back wall, and approached across the back access yard by a door in the back wall of the shop. Sanitary accommodation for customers is not generally necessary.



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H*

11. *The Motor Vehicle*

Introduction—This section is concerned with the data and details of planning for all types, housing and service of motor vehicles.

There are several Acts of Parliament and statutory rules and orders which set out specific requirements as to vehicle sizes and as to storage of petroleum and these have direct bearing on the design of buildings and lay-out connected with motor vehicles. The most important of these publications are " The Petroleum (Consolidation) Act, 1928," " Statutory Rules and Orders, 1929, No. 952, Petroleum," made by the Secretary of State and " Statutory Rules and Orders, 1931, No. 4, Road Vehicles," made by the Minister of Transport. The first and second of these deal, as far as buildings are concerned, with storage and sale of petroleum. A licence is required for the storage of petroleum spirit if more than three gallons is stored and if it is in containers exceeding one pint each.

It is required that petroleum spirit shall be kept in metal containers and the storage space, unless in the open air, must have direct access from the open air. Proper and suitable fire-extinguishers must be kept in or very near the storage place. The storage place shall not form part of or be attached to any dwelling or place where persons assemble for any purpose, unless it is separated by a substantial floor or partition which is constructed of fire-resisting materials and is without openings. The storage place must not be under staircases or other means of exit likely to be used in case of fire unless separated by fire-resisting materials. The Petroleum Act, 1928, also provides for control of the sale of petrol by means of by-laws to be made by local authorities, who issue the necessary licences for its sale. In areas where amenities enjoyed by the public such as scenery, places of historical interest, etc., might be impaired, the design of the buildings and the style of lettering may be controlled and even the establishment of a filling station may be prohibited. The Act also prohibits the emptying in any way whatsoever of petroleum spirit into sewers or drains connected to sewers.

The other publication, namely, " The Motor Vehicles Regulation, 1931," defines many terms used in connection with motor vehicles and in Part I gives specific requirements as to maximum sizes, weights and equipment ; the overall length of a motor vehicle with four wheels shall not exceed 27 ft 6 in, or with more than four wheels 30 ft, except articulated

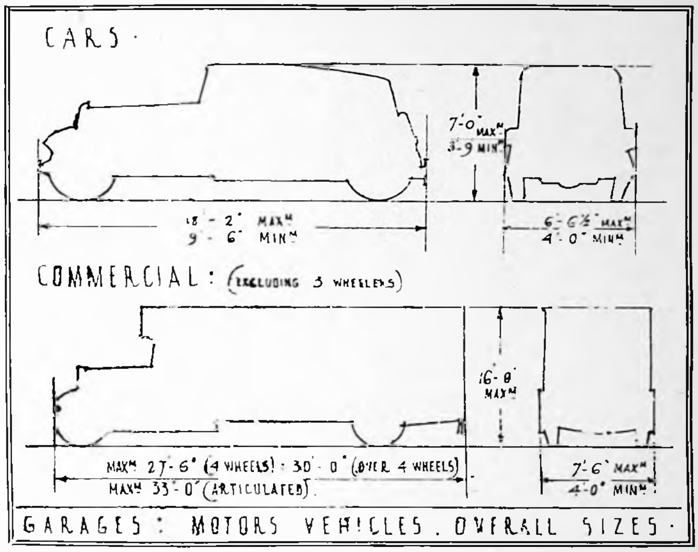


Figure 1

vehicles, which may be up to 33 ft in length. The overall width of motor tractors and heavy motor vehicles must not exceed 7 ft 6 in and the overhang beyond the back axle shall not exceed 7/24ths of the overall length of the vehicle. Figure 1 shows the known maximum and minimum dimensions of private cars and the maximum dimensions for commercial (or " heavy ") motor vehicles as determined by various statutory regulations. The unladen weight of a heavy motor vehicle must not exceed 7¼ tons with four wheels, 10 tons with six wheels, and 11 tons with more than six wheels. Motor-cars shall not exceed 7 ft 2 in. in width and other requirements are similar to those for heavy motor vehicles. Trailers (excluding draw bar) shall not exceed 22 ft in length nor 7 ft 6 in. in width.

Part II sets out regulations governing the use of motor vehicles. The

PRIVATE CARS (BRITISH)*

A Selected List of Various Data (1947)

Make	*Rating H.P.*	*Overall, Standard Saloon Bodies* *Length*	*Width*	*Height*	*Wt (Cwt) Empty*	*Diameter Turning Circle*
Austin	7·99	12′ 5″	4′ 8″	5′ 3″	15¼	37′ 0″
	26·9	16′ 0″	6′ 1″	6′ 5″	—	— —
Daimler	18·02	15′ 0½″	5′ 4½″	5′ 6″	30½	41′ 0″
	35·91	17′ 9¼″	6′ 1½″	6′ 0″	52¾	50′ 0″
Ford	7·96	12′ 8¼″	4′ 9″	5′ 3″	—	35′ 0″
	10	12′ 11½″	4′ 9″	5′ 3½″	—	36′ 0″
Hillman	9·8	12′ 10¼″	5′ 0½″	5′ 2½″	17¾	35′ 3″
Lanchester ...	10·0	13′ 2¼″	4′ 10″	5′ 2½″	22	35′ 0″
.G.	10·9	11′ 7½″	4′ 8″	4′ 6″	—	37′ 0″
M	10·9	13′ 5″	5′ 11″	4′ 10″	20¼	35′ 0″
Morris	8	12′ 0″	4′ 8″	5′ 2″	—	32′ 3″
	10	13′ 10″	5′ 1″	5′ 5″	—	37′ 0″
Rolls Royce ...	29.4	17′ 2″	6′ 1″	— —	25	42′ 0″
Vauxhall	10	13′ 2½″	5′ 0¼″	5′ 5″	18¾	36′ 6″
	14	14′ 1″	5′ 3″	5′ 6″	22½	43′ 0″
Wolseley	8·06	12′ 1″	4′ 8″	5′ 0″	17	32′ 0″
	17·9	14′ 4″	5′ 7″	5′ 6″	28½	39′ 0″

** No full post-war data is yet available ; this table and those following are revised to date and will form a basis for general planning requirements.*

COMMERCIAL, GOODS CARRYING VEHICLES (BRITISH)
A Selected List of Various Data (1947)

Make	*Wheelbase (w.b.)*	*Track (max. dims.)*	*Chassis weight cwts.*	*Total weight with payload*	*No. of Axles*	*Diameter Turning Circle*	*Loading Height (unladen)*	*Type*
A.E.C., Monarch (short w.b.)	12′ 1″	6′ 3″	—	240	2	58′ 0″	—	—
A.E.C. Mammoth Major (long w.b.)	18′ 9½″	6′ 4⅝″	—	420	4	70′ 0″	—	—
Austin, 6 cwt	7′ 4½″	3′ 9″	—	—	2	37′ 0″	2′ 2½″	—
Austin, 5 ton (long w.b.) ...	13′ 1½″	5′ 5½″	37	164	2	54′ 0″	—	—
Bedford, 5/6 cwt	8′ 1¾″	4′ 1¼″	—	24½	2	35′ 6″	2′ 2½″	Van
Bedford, 5 ton (long w.b.) ...	13′ 1″	5′ 4″	41¾	174	2	59′ 0″	3′ 11″	Truck
Commer, 8 cwt	7′ 8″	4′ 2½″	—	28	2	36′ 0″	—	Van
Commer, 4/5 ton	10′ 0″	5′ 5¾″	38½	164	2	40′ 0″	—	—
Dennis, Pax (short w.b.) ...	9′ 6″	6′ 11 7/16″	41	175	2	36′ 0″	—	—
Dennis, Jubilant	17′ 10½″	6′ 3½″	116	380	6	65′ 0″	—	—
Fordson, 5 cwt	7′ 6″	3′ 9″	7¾	20	2	35′ 0″	2′ 0″	Van
Fordson, 10 cwt	7′ 6″	4′ 6″	11	31	2	36′ 0″	2′ 2″	Van
Leyland, Beaver	16′ 9″	6′ 7½″	94½	290	2	62′ 0″	—	—
Leyland, Hippo	17′ 9″	6′ 7½″	134	470	3	70′ 0″	—	—
Morris-Commercial 15/20 cwt	8′ 4″	4′ 10¼″	17½	47½	2	36′ 0″	—	Van
Morris-Commercial, 5 ton ...	13′ 6″	5′ 5¼″	35½	160	2	52′ 0″	—	Truck
Thornycroft, 3 ton(short w.b.)	8′ 0″	5′ 3″	41¼	120	2	35′ 0″	—	—
Thornycroft, 14/15 ton ...	18′ 4″	6′ 2¾″	131½	440	4	70′ 0″	—	Truck
Vulcan (6 V.F.)	9′ 9″	5′ 7″	50*	165	2	55′ 0″	3′ 8½″	Truck
Vulcan (6 P.F.)	13′ 0″	5′ 7″	51¼*	165	2	55′ 0″	3′ 8½″	Truck

* *Including cab.*

COMMERCIAL, PASSENGER CARRYING VEHICLES (BRITISH)
A Selected List of Various Data (1947)

Make	*Single (s) or Double (d) Deck*	*No. of Seats*	*Chassis weight cwts*	*Wheelbase*	*Track (Max. Dims.)*	*No. of Axles*	*Diameter Turning Circle*
A.E.C. (Regent, III)...	d	52/56	—	16 4″	6′ 9″	2	60′ 0″
A.E.C. (Regal, III) ...	s	39/41	—	20′ 0″	6′ 8½″	2	69′ 0″
Dennis (Falcon II) ...	s	32	45	16′ 1″	5′ 11″	2	60 0″
Dennis (Lance) ...	d	—	90	16′ 3¾″	6′ 5¼″	2	59′ 0″
Leyland (Titan) ...	d	56	112¾	17′ 6″	—	2	—
Leyland (Tiger) ...	s	—	—	19′ 0″	—	2	—
Morris-Commercial ...	s	26/32	32	13′ 6″	5′ 3½″	2	52′ 0″

LONDON PASSENGER TRANSPORT BOARD

Omnibuses	Length Overall	Width Overall	Laden Weight (Tons Cwt Lb)	Seats	Diameter Turning Circle
Type L.T. (Single Deck) ...	**29′ 9½″**	**7′ 6″**	**8 14 6**	**35**	**60′ 0″**
Type S.T. (Double Deck) ...	**25′ 5¼″**	**7′ 6″**	**9 15 3**	**50**	**60′ 0″**
Type S.T.L. (Double Deck) ...	**25′ 11¾″**	**7′ 6″**	**9 10 2**	**56**	**60′ 0″**
Type L.T. (Double Deck, 6 wheels)	**27′ 3″**	**7′ 6″**	**11 7 2**	**60**	**66′ 0″**
London Taxi (Regulations) ...	**14′ 0″ max.**	**5′ 9″ max.**	**—**	**—**	**25′ 0″ max.**

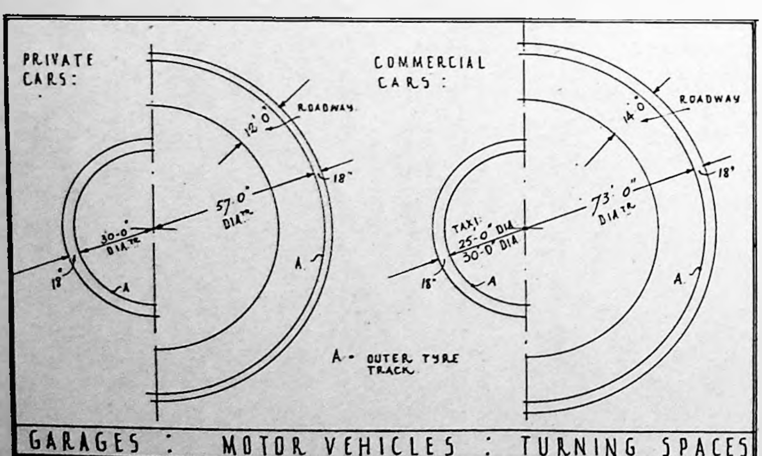


Figure 2

sum of road weights transmitted to the road surface by a heavy motor vehicle and a trailer together shall not exceed 22 tons. The weight transmitted by any one wheel of a heavy motor-car shall not exceed 4 tons, and the sum of the total load transmitted to the ground by all the wheels of a heavy motor-car shall not exceed 12 tons if the vehicle has four wheels, 19 tons if six wheels and 22 tons if more than six wheels. No motor vehicle which exceeds 26 ft in length shall draw a trailer. Trailers may not be used for the transport of passengers.

These dimensions and weights have direct bearing on both design and construction of all buildings and parking spaces for the use of motor vehicles, particularly as to head-room, width of parking spaces, floor loads in multi-storied garages, sizes and curves to ramps, etc.

No regulations appear to have been made in regard to height of vehicles, but the Ministry of Transport have fixed 16 ft as the minimum clearance space under new bridges over roads; in this connection it should be noted that the ordinary London Passenger Transport Board's omnibuses are approximately 14 ft and pantechnicons about 12 ft high overall.

Garage Sizes—It will be seen from the tables that sizes of motor vehicles vary greatly, and maximum anticipated dimensions must therefore be assessed for each particular building. The tables are based on the "Schedules" published by the Society of Motor Manufacturers and Traders, Ltd., Statistical Department, of 83, Pall Mall, London, S.W.1 (price 2s. 6d. each), for private and commercial types.* The tables are made up of a selection of some of the best-known makes with, generally, the smallest and largest of the standard productions. The lengths, widths and heights are given as overall dimensions for private cars and over chassis for commercial vehicles, the weights are for unloaded vehicles including standard bodies given in hundredweights. The turning circles are based on the diameter required by the outside wheel, to which additions must be made as illustrated in Figure 2 and which are discussed below.

Turning Space—A very important factor in planning for motor vehicles is the space in which the vehicle can make a complete turn without reversing. Single driveways must accommodate ordinary motor vehicles without the possibility of having to reverse; for the actual parking of cars this factor is of less importance but the ease of manipulation into limited spaces is based on the turning circle required by each vehicle. The term "turning circle" is a little confusing as it is frequently assumed to be the space required between brick walls of unlimited height in which the vehicle can make a complete turn

* Full post-war schedules are not yet available; but the tables have been revised to date.

without touching the enclosing wall, whereas it is generally the diameter of the curve traced by the outside wheel when making a circle at the maximum lock of the vehicle. Figure 2 shows the maximum and minimum turning spaces required for private motor-cars and for commercial vehicles; these are based on the turning circles of the vehicles, to which 18 in are added for clearance of wings and bumpers. The innermost line of the larger diameters in each case indicates the minimum desirable roadway width within which the area need not necessarily be paved.

Approaches to Private Garages—Frequently, as an economy, long approaches to garages are not paved for their entire width, except close to the garages where the roadway may become a turning or washing space. Figure 3 illustrates the necessary widths for driveways and also the minimum widths if stone, concrete or other hard paving is found necessary. If deliveries to the house are likely to be made by heavy lorries provision must be made for maximum

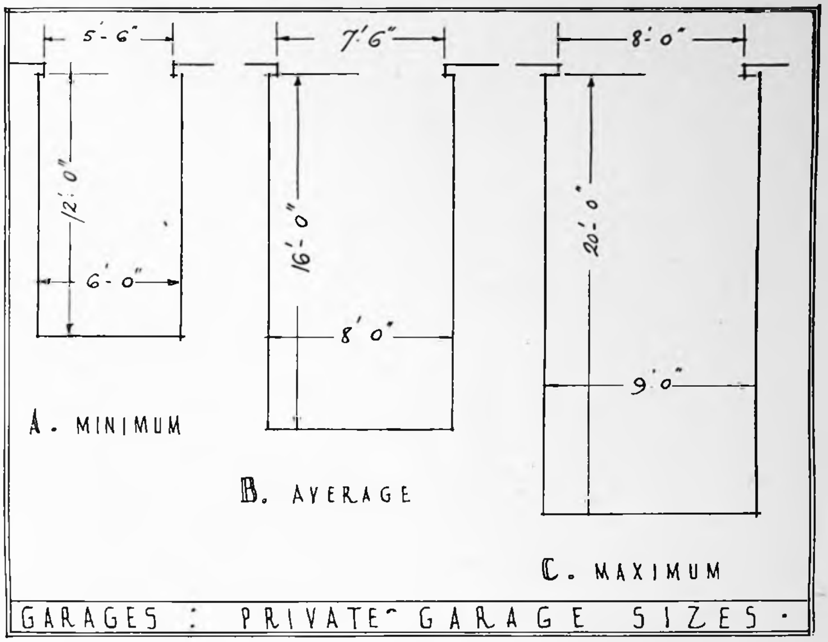


Figure 4

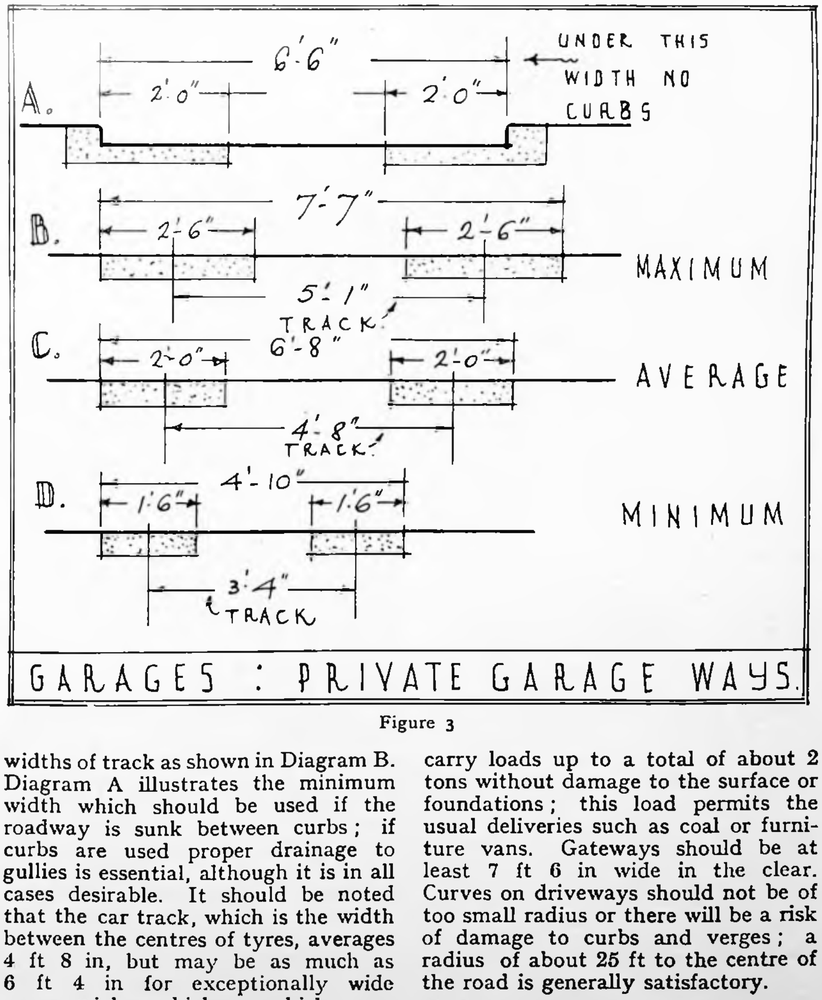


Figure 3

widths of track as shown in Diagram B. Diagram A illustrates the minimum width which should be used if the roadway is sunk between curbs; if curbs are used proper drainage to gullies is essential, although it is in all cases desirable. It should be noted that the car track, which is the width between the centres of tyres, averages 4 ft 8 in, but may be as much as 6 ft 4 in for exceptionally wide commercial vehicles, which are unlikely to use private house approach roadways.

All drives should be constructed to carry loads up to a total of about 2 tons without damage to the surface or foundations; this load permits the usual deliveries such as coal or furniture vans. Gateways should be at least 7 ft 6 in wide in the clear. Curves on driveways should not be of too small radius or there will be a risk of damage to curbs and verges; a radius of about 25 ft to the centre of the road is generally satisfactory.

Private House Garages—The relation of the garage to the private house is dealt with at length in the section on "The House." The garage may be either detached or it may form part of the house, or have rooms over for residential purposes such as chauffeur's quarters. When the garage forms part of the house it must be completely cut off by 9 in of brickwork for walls, the ceilings either being of solid concrete, asbestos-covered wooden joists or "pugged" with slag wool or other fire resisting material.

Sizes of Garages—Motor-cars vary in length from about 9 ft 6 in to 18 ft 6 in overall, but for general purposes a length of 16 ft in the clear may be assumed for a private garage. Widths vary from 4 ft 3 in up to 6 ft 6 in. At least 18 in extra should be added to these widths to allow the car doors to be opened and for circulation round the car. Figure 4 illustrates (Diagram A) the minimum garage dimensions for the smallest cars made, in Diagram B good average dimensions for use with all but exceptionally large cars, and in Diagram C the dimensions will cater for the largest private motor-cars made in this country. These dimensions should be enlarged wherever possible particularly to provide for storage and bench space. Figure 4 also suggests suitable door widths, the dimensions given being in the clear between frames. Few private cars exceed an overall height of 7 ft and doors with a clear opening height of 7 ft 6 in are satisfactory. The width of a garage for two cars may be slightly less than double that housing only one, but it should not in any circumstance be less than 14 ft. Permanent ventilation should always be provided both near the ceiling and slightly above the floor. Some form of heating is desirable to keep the temperature above freezing in cold weather. Ade-

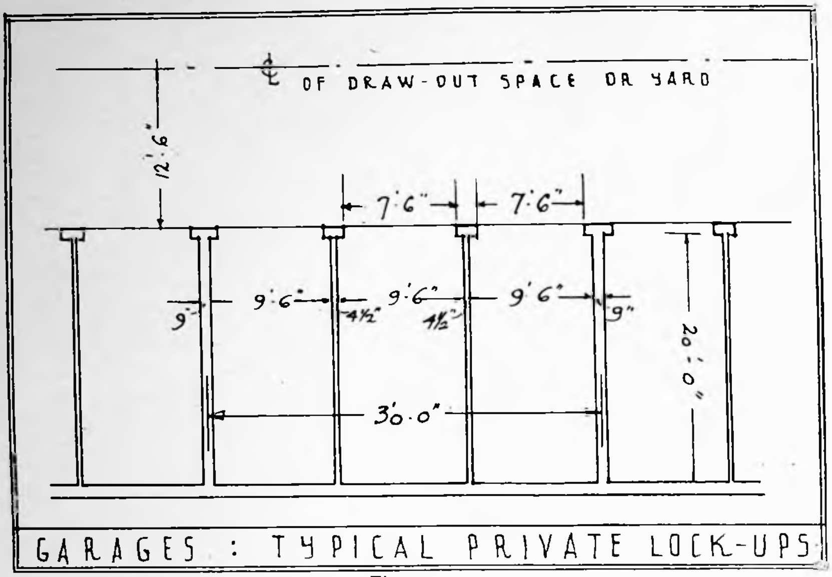


Figure 5

quate day and artificial light is essential and should be properly placed to light the engine. A cold water supply is needed for car-washing and, to avoid risk of freezing, is better if placed inside the garage and fitted for a hose connection.

Washing Spaces—These should be provided in all cases and, where possible, not visible from the main approaches to the house. A concrete surface laid to fall to a centrally placed gully is most satisfactory. A good size for washing spaces is 10 ft wide by 20 ft long, considerably wider than a car to prevent the possibility of mud being splashed on to the parts already cleaned. The drainage presents a slight problem as the regulations vary somewhat in different districts; some authorities allow drainage to stormwater drains with an ordinary gully, especially if there is provision for only one car, while other authorities require proper petrol gullies sometimes connected to soil drains and sometimes to stormwater. If several cars are kept together most authorities require the use of petrol gullies.

Private Lock-up Garages — In many districts where houses have insufficient space for an individual garage, some other provision has to be made in the form of grouped garages which are frequently attached to a motor business or to a petrol or service station. Blocks of flats also adopt a similar system. Whenever possible car owners prefer their own lock-up garage to a standing space in a large covered or enclosed area. Such lock-up garages should be at least 8 ft wide by 20 ft long, permitting space for a bench in addition to the car except with very large vehicles. Figure 5 illustrates a typical plan which is based on building regulations requiring the maximum length of a 9-in wall to be 30 ft and for intermediate cross walls to be only 4½ in thick. Local authorities vary considerably in regard to the type of construction they will permit for garage buildings of this type. Some districts require each compartment to be separated by a 9 in wall, others permit the scheme shown on Figure 5 but sometimes ask for the 9 in walls to be carried up above the roofs if the latter are of timber construction; other authorities permit breeze dividing partitions and some others even permit 4½ in brick or concrete block walls throughout. The roofs are often constructed of joists and boarding covered with asphalt or bituminous felt.

When a row of garages is constructed the turning space should be at least 20 ft and preferably 25 ft wide as shown on Figure 5. A similar space is sufficient if garages are placed on both sides of the driveway; the whole of this space should be paved and laid to falls to act as washing space. Such ranges of garages can be lighted and ventilated through the front wall which consists mainly of the entrance doors; these doors are, therefore, sometimes glazed.

Lock-up garages attached to flats should be so placed that they are not near ground-floor windows as they are detrimental to letting values of flats. If possible the garages and washing spaces should be screened.

Lock-up garages should have some heating facilities for winter which can be provided by means of a radiator system operated by a small independent coke boiler placed in a heating chamber. In the case of flats, rows of garages may be heated from the general heating plant.

The Open Garage—In cities and towns land values prohibit separate lock-up garages nor, in many instances, are they particularly necessary. Open garages provide large undivided floor spaces, on one or more floor levels where cars are arranged in rows. As the majority of car users often come and go in rush periods of short duration, easy access to and from car berths is essential, therefore planning has to be based on single rows of cars placed on either side of driving aisles; these aisles must be of such widths as to allow for driving a car in and out of a berth between two other vehicles without risk of damage. The berths are usually based on a width of 7 ft and a depth of 15 ft, which is sufficient for all but exceptionally long cars which may either be placed together in a special part or a special floor of the garage or simply allowed to project into the aisle. The width of berth is arrived at by taking the width of a car as 6 ft and allowing one foot for manœuvring and opening of doors, etc.; in a few garages the berth width is reduced to 6 ft 8 in, but this dimension has proved insufficient. The best method of parking cars is to have the bonnets towards the driving aisle. The width of the aisles should be at least 20 ft although there are few examples where only 18 ft has been allowed. Figure 6 shows typical spacing of car berths based on these dimensions together with widths of buildings necessary to accommodate various numbers of rows. Cars should not be placed in double rows with access on one side only as the time required to move cars from the front row for the removal of a vehicle at the back is too great and confusion is created. In cases of extreme necessity, however, double-row parking has been adopted, considerable saving of space being effected, as in this case one aisle serves four rows of cars.

Any columns required to support superimposed floors or roofs should be placed at least 2 ft 6 in within the 15 ft allowed for the length of the cars to permit easier turning; thus the normal column spacing is about 25 ft (or more) from centre to centre.

The column spacing between bays should be either 15 ft, 21 ft 6 in or 28 ft, which accommodates two, three or four cars respectively. Any spacing between these dimensions is obviously uneconomical.

Multi-floor Garages — Where several floors are to be used, methods of rapid inter-floor communication have to be considered; firstly, by means of ramps or sloping ways, and secondly, by use of lifts; the former, although requiring more actual floor space per car stored, has generally been found to work more satisfactorily in practice owing to the time and trouble saved in getting each vehicle in or out of its berth, especially in rush hours. Ramps are cheaper than lifts in first cost and require very little maintenance, both of which are highly important factors; the ramp system involves no cost in moving vehicles, as they pass from floor to floor under their own power.

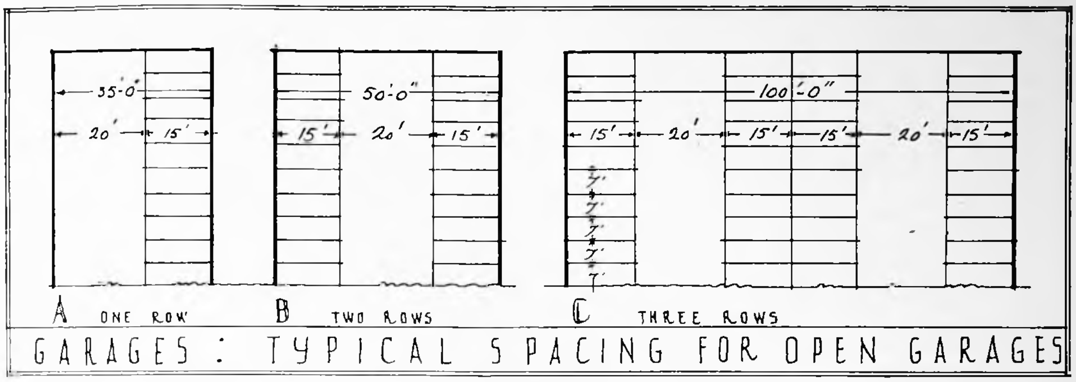


Figure 6

Ramps—The slope of ramps may be as steep as 1 in 5 but they are generally 1 in 7 (or 15 per cent), which requires an approximate length of 70 ft to rise 10 ft 6 in from floor to floor. Turns on the ramps should be slightly banked and the whole surface treated to give a good hold for tyres. The floor heights of garages should give 8 ft 6 in. in the clear between beam casings and the floor level, but on ground floors this is often increased for showrooms and entrances; this difference in levels between floors frequently complicates the design and placing of ramps. The extra ceiling height of ground floors is often extended to basements which may be required for the storage of commercial vehicles which, of course, need a greater height than private cars. The basement is also often used for lock-up compartments for regular users' cars and also for oiling, washing and repair spaces. Accommodation is needed in most garages for lavatories, W.C.s, chauffeurs' waiting rooms, offices, etc., details of the planning of which follow later.

Ramps for smaller buildings may be as narrow as 8 ft 6 in, but they are better if 10 ft is allowed and if vehicles have to pass one another in opposite directions a width of 20 ft should be considered to be the minimum; also if one wide ramp is to be used for traffic travelling in opposite directions, up and down ways should certainly be separated by a curb, or, more thoroughly, by a railing, although such precautions are frequently not taken. If but one narrow ramp is to be used for up and down traffic some system of signalling should be provided, to avoid cars meeting between floors. The radius of the outside curb on all curved ramps should be not less than 20 ft, based on the turning circle of the average-size cars, but it is better to allow a radius of 25 ft, to avoid risk of damage to wings. Figure 7 illustrates three different methods of arranging double-track ramps in buildings; the hatched areas represent the space available for car berths, and it should be noted that certain of these spaces are not readily accessible, as that in the top left-hand corner of Type A. Type A is the simplest, where each floor is level across the building; the ramp may easily be turned (at the lower end in the diagram) for continuation from floor to floor. Type B is somewhat more complicated, but has only one long ramp serving all floors at various points in its length as shown on the section. Type C is a continuous concentric curved ramp; the corners as shown are difficult to utilise, as are also the spaces enclosed by and around the ramps. This system is frequently used for long sites, the ramps sometimes being placed near the entrance or at the extreme ends. The central spaces within the ramps in Type C are seldom useful for storing cars owing to the difficulty of access, but they are, however, useful for motor cycles and sidecar combinations. One fault of Type B is the necessity, on leaving or entering a floor, of crossing the main traffic lines on the ramp.

Figure 8 illustrates further types of garages with several floors connected together by means of ramps. Type A has a single ramp used for traffic in both directions, and is only suitable for garages where the possible number of car berths is not greater than approximately 300, otherwise congestion is likely to result. This type is not very satisfactory except on small sites where space does not permit double ramps, and even in such circumstances a considerable amount of floor space is wasted, as may be seen from Figure 8 and the alternative use of lifts may be justifiable on a central urban.

Diagram B illustrates a double-spiral type of ramp on which traffic cannot meet; this type is satisfactory in space economy and ease in

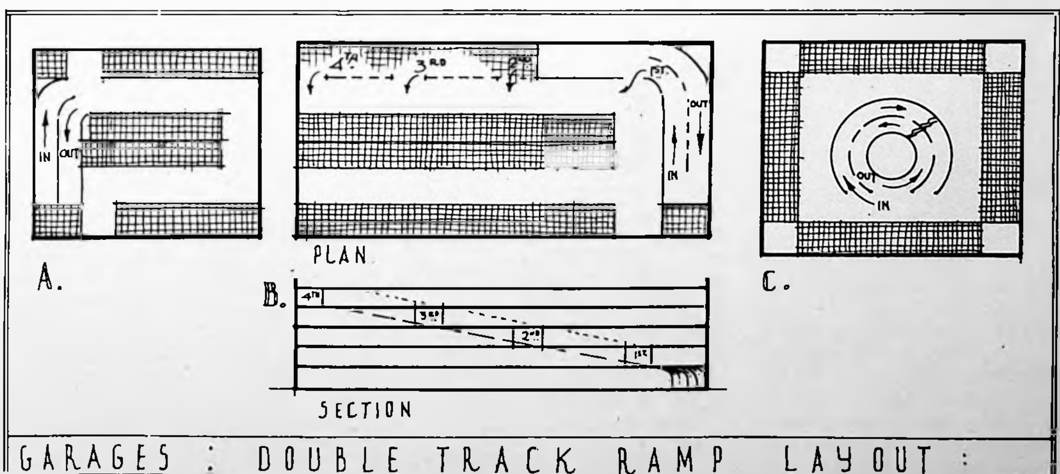


Figure 7

controlling the traffic. This ramp is designed on the principle of a double-thread screw, up-traffic driving on one thread and down-traffic on the other, both ramps using the same space as is needed for a single ramp of the same diameter.

Type C in Figure 8 is divided vertically into two blocks, one block of floors being set half a ceiling-height higher than the other; the floors are connected by short ramps. This system is very efficient as regards proportion of floor space available for car storage to total floor area, and also as regards handling of traffic; this applies more especially when the ramps are doubled and separate tracks provided for traffic in each direction as in Figure 9, Diagram A. One half of the ground floor or basement will have a greater height, as shown on the right-hand side of Diagram C, Figure 8; this additional height is useful for showrooms, parking of commercial vehicles, or for a pressure-greasing department where hydraulic car lifts are used. One disadvantage to the staggered-floor type of building is its uselessness for other purposes should the building not be further required as a garage at some future time, whereas in other types the ramps may be removed and replaced with normal floors comparatively easily. Garages using lifts are even more easily converted to other uses.

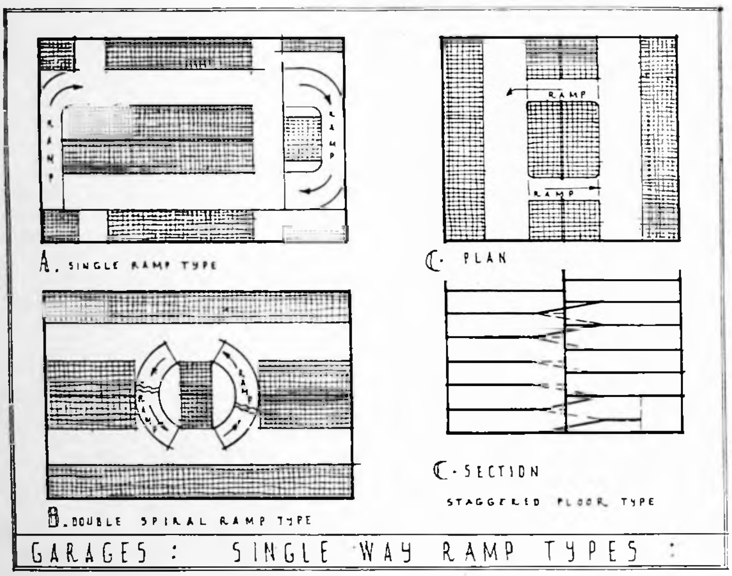


Figure 8

A further development of the ramp is the "warped" floor type of garage as illustrated in Figure 9, Diagram B. In this example the floors are laid throughout the building at a pitch similar to the ramped approaches which they adjoin. There are many factors favouring this system; at the same time there are three disadvantages, namely: in the first place, long sites which are not too wide for more than four berths and two aisles are needed to give sufficiently small gradients; secondly, cars are parked on a sloping surface (although it is very slight—only similar, in fact, to the curve of a normal road surface from crown to gutter), and cars stand across the slope; and thirdly, the building cannot be converted for other purposes. The benefits of the "warped" system are the low gradients utilised, good visibility for drivers and the parking areas are each easily accessible, though the largest possible areas be utilised and easy-turning radii planned. Construction costs are lower in this system than with ordinary ramps, due to the constant pitch of the floor without sharp banked curves, and consequently are very little more expensive than level floors in normal buildings. The authors have not seen or heard of an example of this type in Great Britain, but several examples have been erected in America and Canada which have proved to be very satisfactory. The upkeep cost is negligible.

None of the systems can be claimed as pre-eminent, as site conditions (more especially size and shape) influence the selection of the method of inter-floor travel more than all other factors governing the plan.

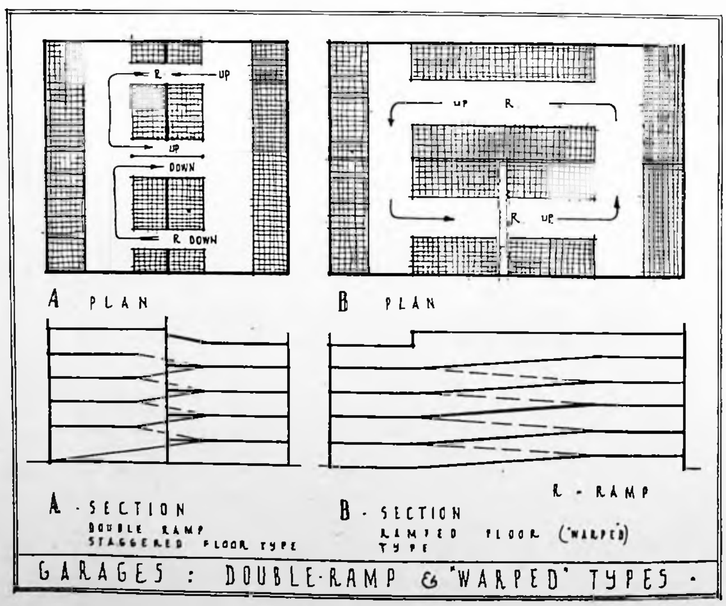


Figure 9

Lifts — Many multi-floor garages are served by lifts in preference to ramps, probably owing to the fact that lifts waste less floor area than do any of the ramp systems and consequently more cars can be stored to any given site area. They are particularly useful for high buildings and for buildings on small sites. There are also examples in which lifts are used to serve the upper floors only while ramps are installed for the service of the two or three lower floors where cars are parked for short periods and therefore must be handled more rapidly. Lifts for private cars are usually about 10 ft wide and 20 ft long, as shown in Figure 10. Sometimes the width is reduced to about 8 ft only and the length to 18 ft, but the larger sizes are to be preferred. A lift 20 ft by 10 ft requires a well-hole about 21 ft 6 in by 11 ft 6 in as shown in Figure 10; when several lifts are installed in a battery, less space per lift is needed. Lifts of such dimensions, having overhead machinery, require a height of 16 ft to 18 ft above the highest floor level to accommodate the machinery, gearing, cage, etc., and about 4 ft below the lowest. Lifts are sometimes run in open wells surrounded by wire enclosures only, but in larger buildings a fire-resisting enclosure is desirable, together with automatic fire-resisting cut-off doors or shutters at each floor level, so as to avoid the risk of

fire spreading from one floor to another. The length of the lift being longer than the 15-ft allowance for car-parking berths, complications are apt to arise in laying-out car berths, as the lift-well may project into the aisle where clear space is essential. The number of lifts required for a garage building presents a difficult problem. Two should be considered as essential to permit dealing with rush periods, and also to guard against a possible breakdown, which, if only one lift is installed, removes the car's only means of entering or leaving the building. Generally, it should be assumed that two lifts will handle up to 250 cars. Lifts are usually run at speeds of about 30 to 40 ft per minute ; high speeds facilitate rapid handling of vehicles, and they should be designed to carry at least thirty cars in one direction per hour to the highest floor level. Sometimes lifts are designed to carry two vehicles side by side, but it is doubtful if this is, in fact, a real advantage over two separate lifts, except in initial cost and possibly in running costs, and the benefits may easily be offset by delay in handling vehicles.

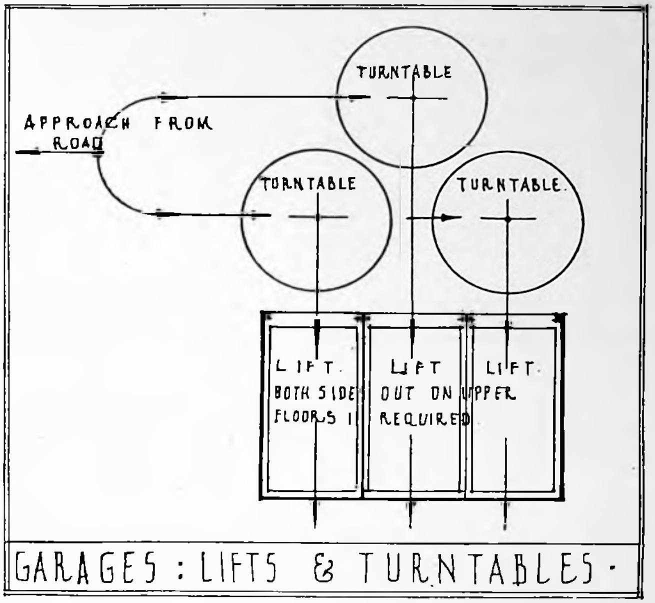


Figure 11

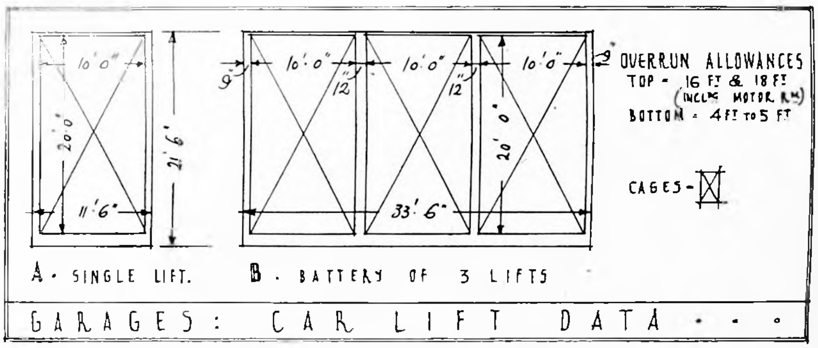


Figure 10

Turntables—Turntables are often needed in garages where lifts are installed in order to move cars into lifts which may not be placed directly in the line of approach. These turntables should be at least 16 ft overall or better slightly more, although they can be made just sufficiently large to carry to maximum wheelbase of any car (namely, 12 ft 6 in), but it is wiser to have them as long or longer than the overall length of the cars, thus avoiding the possibility of damage to other vehicles or persons standing too near the moving floor. Turntables should move easily and quickly ; they are usually installed without mechanical means of movement, but occasionally, to increase speed of movement, the turning is done by electrical power. Turntables for commercial vehicles need not be greater than 22 ft 6 in. in diameter, and are often mechanically propelled. If there are definite and usual movements from one point to another which are at all regular, it is convenient to have stops to save time in adjusting the amount of the turn.

The placing of lifts and turntables is entirely dependent on the size and shape of the site and economic-berth placing. Generally, lifts are placed as far as possible from the entrances in order to have the maximum space for movement of cars before reaching the lift. There are, however, several examples where the lifts are placed at the entrance so that vehicles on arrival drive directly into the lift. It should be borne in mind that lifts are fairly costly to install and need power and labour for their operation, as opposed to ramps on which cars are propelled by their own power.

Figure 11 illustrates an arrangement of turntables to serve lifts which have had to be placed at right angles to the main approach to the garage. The placing of turntables presents a minor difficulty in so far as each requires a larger space than the width of the lift which is served, thus necessitating the staggered lay-out shown. As regards upper floors, turntables may not be necessary, as the time taken to manœuvre a car into its berth, once it is out of the lift, is not so important, since each floor only handles a proportion of the total traffic, according to the number of floors in use ; however, it may be wise in order to speed up handling on the upper floors, to make each lift primarily serve certain floors and to arrange the turntables on each of these in front of the particular lift assigned to the floor. The lifts, as shown, may be made to give access to floor areas placed both in front and behind the lifts, which means the placing of the lift somewhere towards the centre of the building. In such an example as this it would probably be wise to install fire-resisting doors or shutters at both ends of the lifts to overcome any risk of fire spreading by way of the lift shaft from one floor to another.

For convenience and rapidity of handling, lifts are frequently installed with turntables fitted inside the cages and two or more entrance and exit gates, so that when the lift reaches any particular floor level the vehicle in it may be turned so as to be driven to whichever part of the floor it is to stand without circulating round the floor or having to reverse.

Figure 12 shows two garaging systems based on combinations of lifts and turntables, the latter taking the form of a rotating part of the floor. Diagram A has two lifts placed centrally on a square or circular site, and on each level a portion of the floor, wide enough to receive any size car (16 ft), is made to rotate, so that cars are delivered from the lifts on to this band, and while the lifts are dealing with other cars, the floor is turned until the car stands in front of a vacant berth, into which it is driven or pushed ; when all the berths are full the rotating floor may then be loaded, leaving one vacant place to carry the first car wishing to leave. The system is probably difficult as regards construction and mechanism ; in addition, approximately square or

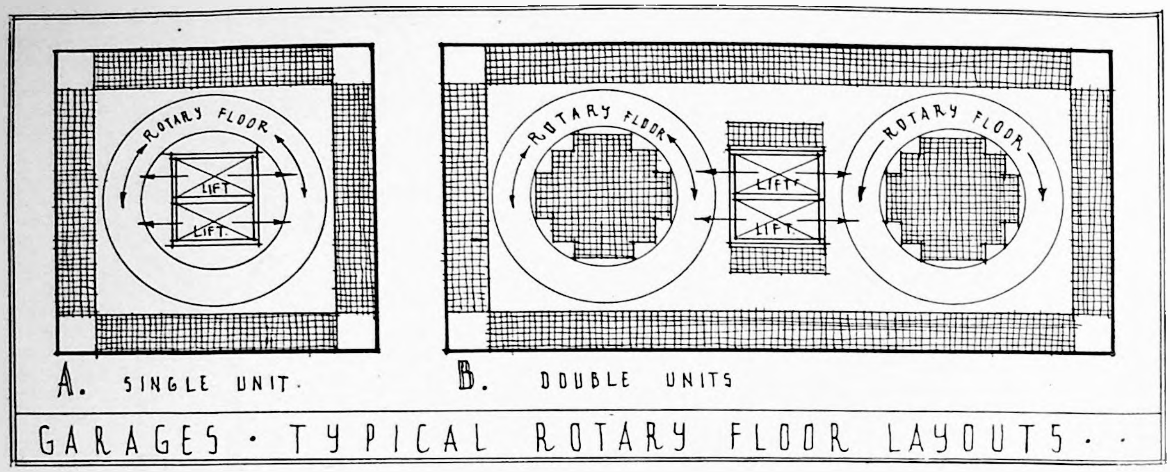


Figure 12

circular sites are needed, and there is waste space on each floor which cannot be used for parking. Diagram B illustrates a similar system adopted for use with a rectangular site of about two squares in area; in this example two lifts, each delivering in two directions, are placed centrally with a rotating floor area on each side, on which vehicles are moved as in example A. In example B the central areas within the rotating floors may also be used for parking. It is desirable in both types shown on Figure 12 to install two lifts, to avoid slowness of service and congestion and to guard against breakdowns. The rotating floors, owing to the possible total weight of cars which may be on them at any time, should be made of steel plates and should be mechanically operated. The blank spaces at the corners on the diagrams are useful for staircases, passenger lifts, lavatories, etc.

There have been several American schemes of car parking, based on the idea of platforms which are attached to continuous hoists. The cars are run on to a platform, which rises until the one side is fully loaded, after which the machine continues and the platform crosses over the top and commences to descend on the other side. To remove any vehicle the whole is revolved until the platform required is at the ground level. This system seems expensive to install and maintain, and has only a small storage capacity, but it only requires a ground area of about 22 ft square. Several methods of inter-floor travel by means of lifts have been suggested where cars are placed on turntable trucks or traversers, either on entering or leaving the lifts, the truck then being moved along a track from the lift and turned so that the vehicle faces the berth allotted to it. These systems seem to call for too much handling of cars and consequent loss of time, compared with ordinary lifts or ramps on which the car uses its own power for manœuvring into berths; in aisles required for turntable tracks no saving is achieved over the width of aisles required for normal parking. The tracks, however, require greater floor thickness, as they have to be sunk so that the top of the track is at floor level.

Figure 13 suggests a system of ordinary lifts for a large garage building placed in such a manner that turntables are unnecessary. The approach or driveway from the lifts is easily negotiated within the "lock" of a car moving under its own power; the loss of space is in reality little more than that of a ramp system, while ease and speed of movement of vehicles is considerably more than that obtained with an ordinary square battery of three lifts. The central space may be used for a staircase or passenger lift for use of car owners, chauffeurs and garage staff, or, if required, for an open well for fire-escape purposes. The lifts arranged in this manner require rather more enclosing brickwork than for a bank of three lifts, but the number of doors and shutters required for double-ended lifts is the same as needed in Figure 11. Figure 14 suggests a scheme for use where the lower floor space is used for showroom requirements. One turntable serves the three lifts from the main entrance, after which the cars move under their own power on upper floors.

Roofs—The roof of a multi-story garage may be used for open-air parking at lower charges than are made for the covered areas. Access is obtained by continuing ramps or lifts, but precautions have to be taken to prevent rain running down ramps to lower floors or down lift-wells. Ramps should be roofed over and enclosed on the outer

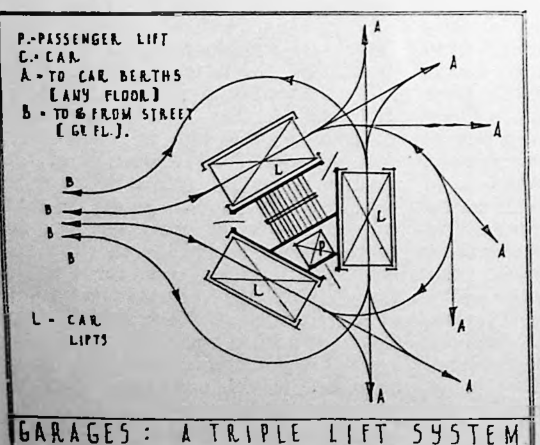


Figure 13

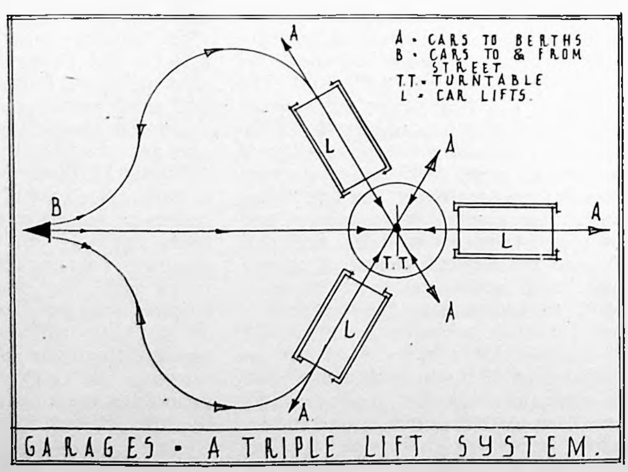


Figure 14

side right up to the end to protect the floors below. High parapet walls are desirable, and in some instances they might need to be as much as 8 ft high as a fire protection for adjoining property. The lay-out of parking spaces or berths on roofs would be exactly similar to that on lower floors.

Regulations for Large Garages—Public authorities and insurance companies insist on very stringent regulations regarding construction and use of multi-floored garages. These regulations are definitely laid down in only a few instances, but under approval powers various conditions have come to be generally recognised. Very special consideration has to be given to means of escape from upper floors, and usually two staircases are needed, enclosed in fire-resisting materials and giving access to the open air ; also it is required that the approach to the staircases on each floor shall be through an open-air cut-off. When buildings are of more than one or two stories it is desirable that each floor should be cut off from the others by means of automatic fire-resisting shutters or doors.

In some districts openings are not permitted connecting the ground floor and basement except through the open air, and when basements in buildings over 250,000 cu. ft in content, are used for car parking, it is necessary to provide windows extending from floor to ceiling for 30 per cent of the perimeter of the floor, and where street frontages are not available made to open on to areas called " blast ducts."

Battery, machine and oil store rooms have to be cut off from the remainder of the building by fire-resisting partitions, and have to be approached through the open air. Offices, chauffeurs' rooms, etc., must be partitioned off from parking areas by means of fire-resisting partitions and doors.

Petrol tanks of vehicles must not be filled within the building, or nearer than 20 ft to the back edge of a public footway.

Staircases—All staircases should be enclosed and cut off at each floor level with fire-resisting doors, but, in addition, the escape stairs should have the safeguards already suggested. The staircases may be required to be ventilated from the open air by the omission of the glass to the openings, which should be of large area with simple fire-resisting self-closing doors at the landings, but in some instances a similar arrangement, as shown in Figure 15, Diagram B, is adopted with the addition of an automatic fire shutter controlled in conjunction with the sprinkler system. In many buildings a scheme as shown in Figure 15, Diagram A, is used ; this arrangement consists of a lobby, formed by two fire-resisting doors, which is ventilated to the outside air, thus forming a complete cut-off between

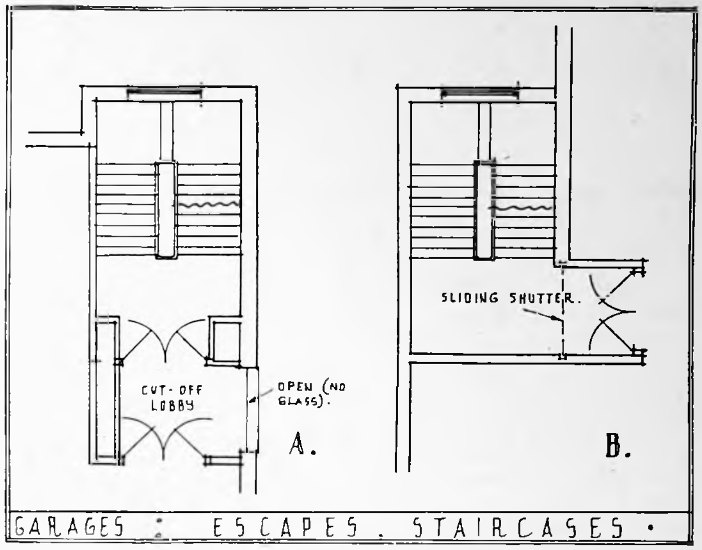


Figure 15

floor area and escape staircase serving other floors of the building.

Lifts—In addition to any lifts installed for moving vehicles from floor to floor, passenger lifts are desirable, and in the case of many-floored buildings are necessary to convey owners to the floors on which their cars are parked, or to convey garage drivers to the car berths in order to hasten delivery to owners waiting at the entrance to the garage. These lifts need not be of very large capacity but should be of fairly high speed ; automatically-operated lifts are generally satisfactory unless many of the public are likely to use the lifts, when it may be advisable to install attendant-operated lifts.

Lighting—The various floors of a multi-story garage should have the maximum amount of daylight possible, having regard, however, to the provision of sufficient solid walling between each floor level to protect the floor above from direct action of flames in the event of fire.

Adequate lighting is necessary on ramps and, as this cannot always be provided by means of windows in daytime, well-spaced lamp fittings are essential and should be arranged to shine as little as possible into the eyes of drivers as they ascend or descend the ramp. This point requires special consideration if traffic in both directions uses the same ramp.

Artificial lighting of the ordinary floors should be by means of fittings installed over driving aisles where most light is needed and, when placed in such positions, should give sufficient light for general purposes over the remainder of the floor area.

Heating—A heating installation is essential in all multi-floored garage buildings, although temperature to be maintained need not be very high.

Ventilation—Upper floors of garages are frequently not provided with artificial ventilation, but it is often necessary in the case of floors below ground level or on any floors where natural through currents of air are difficult to arrange. It should be borne in mind that fumes in garages which have to be controlled by a ventilation system may be heavier than air and should, therefore, be extracted near floor level and owing to the presence of carbon-monoxide ; discharge should be made at roof level.

Entrances—Some local authorities restrict the width of roadways crossing pavements to a maximum of 20 ft, presumably to safeguard pedestrians ; this width permits only two lines of traffic and if more traffic-ways are needed, an island separating each crossing should be introduced in order to divide the roadways into units of 20 ft, or less.

The relation of entrances to surrounding streets is of the utmost importance. Junctions of streets are generally to be avoided, as traffic may be held up at the crossing and impede the garage entrances and exits ; exits into busy streets are also apt to lead to road congestion.

It is advantageous to have approaches from two different streets to avoid congestion of traffic and temporary traffic blockages in either street. It is better to have garage approaches placed in streets which are not main traffic routes, although there is a loss of advertising value through the buildings not being easily visible to rapidly moving traffic on main roads.

The actual entrance and exit to the building itself should be under one control as, for example, on each side of a control office, thus reducing the labour required to look after vehicles entering and leaving the building, but in very large schemes separate controls may be desirable. The entrance to the building itself should be set back on the site in such

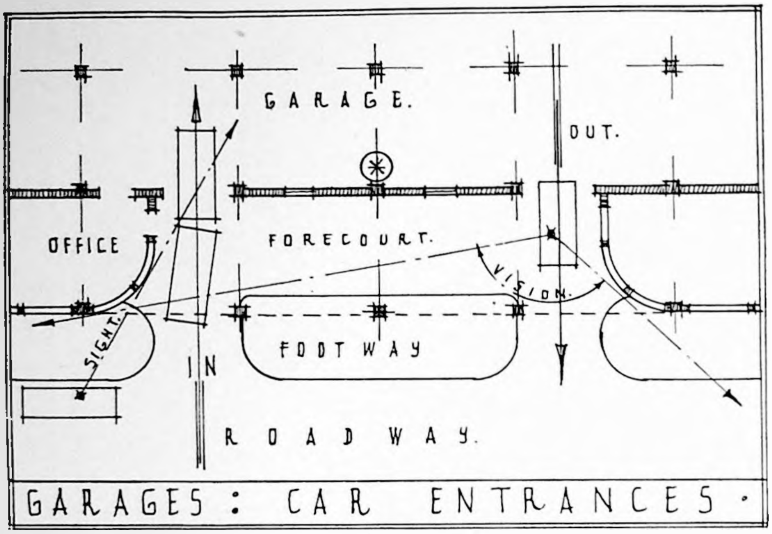


Figure 16

a manner as to provide a forecourt in which traffic may wait on arrival or on leaving, without disturbing road traffic or pedestrians ; these forecourts are also used in most schemes for the service of petrol, oil, and other supplies. Figure 16 illustrates a typical entrance lay-out based on this forecourt principle. This figure illustrates a further important factor, which is the desirability of opening up approaches as much as possible, so that vehicles on the road or leaving the garage may be visible to one another, thus avoiding congestion and accidents ; in this figure it will be noticed that a vehicle moving along the road across the exit may be seen more easily by a car leaving the garage than if a square setback had been used. Direct access into the building from the road without a forecourt makes visibility poor for drivers leaving the garage and virtually necessitates a look-out man to control the exit.

Figure 16 also shows two good positions for control offices, the one being at the entrance as shown on the figure which may be repeated on the exit side of the building if required, the other position is marked by an asterisk. The latter position provides control of both entrance and exit to the building as well as control of forecourt and any pumps that may be placed there. In each of the positions the control office may be approached either from the forecourt or from inside the garage itself, which is very essential This office should have telephonic communication with all floors and departments of the garage.

Entrances and exits should not be placed in one-way streets unless there is a one-way street on each side of the building with traffic in different directions, in which case the entrance to the garage should be in one street and the exit in the other ; particularly clear direction signs should be installed for guidance of vehicles both entering and leaving the garage.

If space permits, the ground floor of the building should not be used for ordinary parking but should be given up to showrooms and offices, to car washing, battery service rooms, etc., with ample turning and circulation space for cars.

Showrooms—Showrooms are generally placed on the ground floor of garage buildings so as to provide for show windows and other display space to the street ; occasionally part of the first floor is also used. Showrooms are often divided by entrances and exits to the garage portion of the building, but, on the whole, it would seem better to avoid this division and group all show-space together. On the other hand, it may be argued that clients calling to collect cars from garage berths should be made to pass through the showrooms, if possible and, in any case, it may be advantageous to place the public waiting room for the garage adjoining the showrooms. Showrooms should be separated from the garage either by a solid background or glazed screens, the former being more satisfactory from the point of view of designing the show-space as seen from the street. Special consideration should be given to the use of curved non-reflecting show windows ; motor-cars are generally seen in the open air, and when seen through non-reflecting windows the illusion of open air is better suggested. Car access to show-space is generally from inside the building through the background or back division screen, thus eliminating the necessity of making part of the street window to open ; although the latter may be unavoidable on small sites, it is expensive on a large scale. Show windows for motor-cars should not, in general, be less than 20 ft in depth ; in addition, thought should be given to the provision of suitable display windows or cases of shallow depth for accessories.

Proper sales counters are needed for spare parts and accessories, and their design should incorporate a display of the most attractive and saleable accessories and not merely be, as is so often the case, a very dirty, oily bench or rough counter. These sales counters are generally better placed on the ground-floor level with lift communication to store rooms, which may be placed either in the basement or at the top of the building.

Lavatories—Lavatories are required for the use of male and female visitors, chauffeurs, garage and office staffs. Those for the use of visitors should be placed near the public waiting room, and those for the chauffeurs adjoining the chauffeurs' room. Accommodation for the garage staff should be grouped together in small buildings, preferably near the workshop or repair department, but in large garages provision is desirable on each floor to save loss of time. Office staff lavatories should be attached to the offices. It is, of course, advantageous to plan lavatory accommodation in similar positions on each floor in order to group plumbing services together. Each lavatory should provide washbasins and W.C.s. Attached to visitors' lavatories changing rooms and baths are occasionally installed, for use of out-of-town customers who wish to change into evening dress. The staff lavatories should also provide space for the installation of lockers for outdoor clothes, overalls, uniforms, etc.

Waiting Rooms—A room should be provided where customers or friends may wait and it should be placed on the ground floor and near the entrance. It should have easy communication with the inquiry counter and also be near the passenger lift to the upper floors. Some garages provide staffs for handling the cars from entry to exit, to avoid the necessity for the customer to waste time in the actual parking of the car on upper floors. Waiting rooms should be comfortably furnished and pleasantly decorated. In some instances a parcel room has been installed near the waiting room, to which shops may deliver parcels of goods ordered in the town for collection by the customers when leaving in their cars ; this system often saves shopkeepers long delivery journeys and also encourages garage business, as customers are more likely to park cars instead of driving from shop to shop.

Chauffeurs' Room—As chauffeurs often have long waits for their employers, it is wise to provide a room for their use. The room may be placed on any floor, but should have telephones and loudspeaker communication to the inquiry bureau, and should be placed near the passenger lift. A canteen and small service pantry is often provided to serve light meals to chauffeurs and the pantry may at the same time provide for a staff canteen.

Offices—The administrative offices, other than the control and pay offices at the entrances and exits, may be placed anywhere in the building, although they are better within easy access of the customers' inquiry office and sales counters. The office staff is generally small even for a very large garage and therefore only about three or four rooms are usually needed; these generally consist of a manager's office, typists' room and a book-keepers' room. Small offices for superintendents are usually needed on each floor in large buildings; these are often tucked away quite satisfactorily in any odd corner useless for car parking, but the offices should be so placed as to have good visual control of the whole floor area.

Store Rooms—Store rooms are required for spare parts, accessories cleaning materials, etc., generally planned where communication can easily be provided by means of lifts to the sales counters or to the repair departments. Space usually does not permit stores on ground floors, therefore, but are usually planned in basements or on top floors. The equipment of the rooms consists of suitably designed racks, bins and shelving, made of wood or metal, one or more work benches and a small storekeeper's office.

Car Washing—This is an important department in most garages, and is usually placed either on the ground floor or in the basement. In up-to-date establishments rising and revolving car lifts (see Figure 17) are used for easy accessibility to the under sides of the cars in conjunction with high-pressure water guns to speed up the process of cleaning. The floors of washing spaces should be formed of metal grids through which the water and dirt passes on to cement floors laid to falls discharging into proper gullies designed to collect petrol and oil. The metal grids allow workmen to stand on a comparatively dry and clean surface. The rotating car lifts are generally 18 ft long for private cars and consequently need the area of a circle of 18 ft in diameter for their installation. The lifts are raised either electrically or hydraulically. Adjoining the washing space should be several berthing spaces for waiting cars and for economy these may often be shared by greasing and oiling departments which are frequently planned close to the washing section. Rotating car lifts are also installed for greasing purposes but sometimes alternatives such as raised tracks with inclined approaches or inspection pits are used. Lifts or racks with inclined approaches eliminate the use of inspection pits and tend to facilitate better work and service. Care has to be taken with raised tracks and similar fittings, in order that suitable lighting is available to illuminate the under side of raised vehicles.

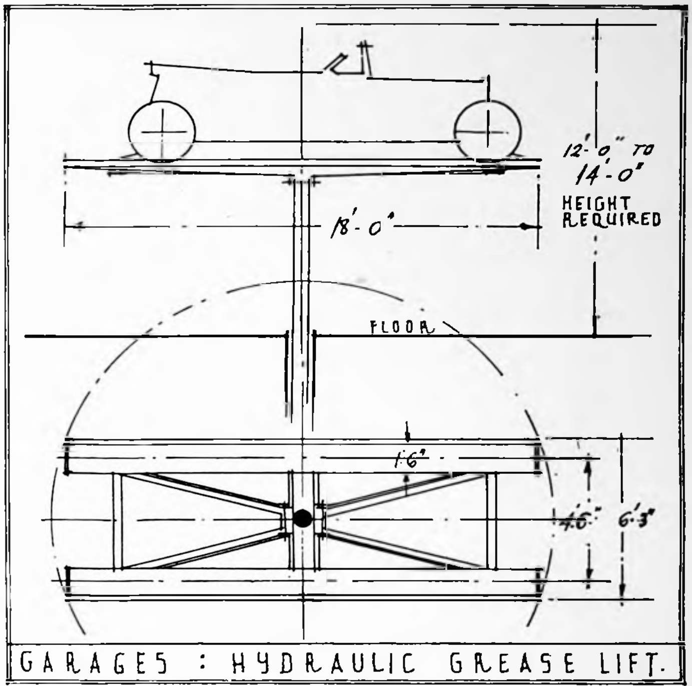


Figure 17

Repair Shops—These may be planned either in basements or on ground floors, but are seldom placed on upper floors except top floors. Badly damaged vehicles or those not running under their own power are difficult to move to the higher floors.

Car lifts are also useful in repair shops so that the work in hand may be lifted to a comfortable working level. Inspection pits are still used in many garages and involve little upkeep cost and low initial expenditure as compared to lifts or raised tracks. It should be remembered that lifts require a clear height of 12 ft to 14 ft above floor level, as well as space below for the ram, whereas pits do not necessitate extra floor height but can only be used on the lowest floor. Work benches and machinery should have ample space and good daylight if possible, while the whole repair shop should be cut off from the garage itself by solid partitions and large sliding doors or shutters. If painting or cellulosing is to be undertaken, a separate department should be formed adjoining, but cut off from the repair room by fire-resisting partitions and doors, and should be approached from the external air. Motors and compressors should also be in a separate compartment cut off from the paint shop. Special ventilation is required for paint-spraying rooms by Board of Trade Regulations.

Inspection Pits—Figure 18 illustrates the simplest form of pit suitable for private or small garages, or for occasional use in large garages. Except when in use, the pit is covered with lengths of timber about 7 in by 2 in, each with lift rings, or battened together in sections about 2 ft 6 in long. The pit is a simple brick or concrete-lined sinking with a rebate to receive the removable flooring. Drainage should be provided.

The width of a pit is dictated by the width of the track of the smallest cars, and is consequently 3 ft maximum; this is narrow, and difficulty is experienced in working under cars of much greater track widths; therefore, if two pits are being installed, one only needs to be the minimum width, and the other may be as much as 3 ft 8 in wide. The depth required for pits is fairly constant, since all cars are, within a few inches, the same height above the roadway to the under sides of the chassis; the usual depth of a pit is 5 ft below the floor level, which allows a man of average height to stand upright and work comfortably under a car. The bottom of a pit should have a slight fall to a drain for removal of water, oil, etc. It is an advantage to have a raised curb of metal fixed round the opening in the floor, and which projects, say, 3 in above it. This partially guides cars and prevents tools being kicked into the pit. It is advantageous to have the pit walls set back from the opening in the floor, as shown in Figure 19, in order to provide space for tool racks, etc. Sometimes fixed artificial lights are installed in boxes in the sides of the pit and are arranged to throw the light upwards, thus illuminating the under side of the car; such a system avoids the possibility of electric shock, as the rubber insulated flex trailing from portable lamps may become perished by contact with oil and can be a source of danger. Figure 19

also illustrates a suggestion for flexible oil drains, which form a connection between a used oil tank and the sump of the car, thus facilitating its drainage. At the ends of pits fixed wheel stops should be installed of a sufficient width to suit the wheel track of the widest cars made, which is about 5 ft.

An overhead runway track should be installed over all public garage pits for lifting and moving bodies, engines, etc., to benches or stands in other parts of the workshop or building.

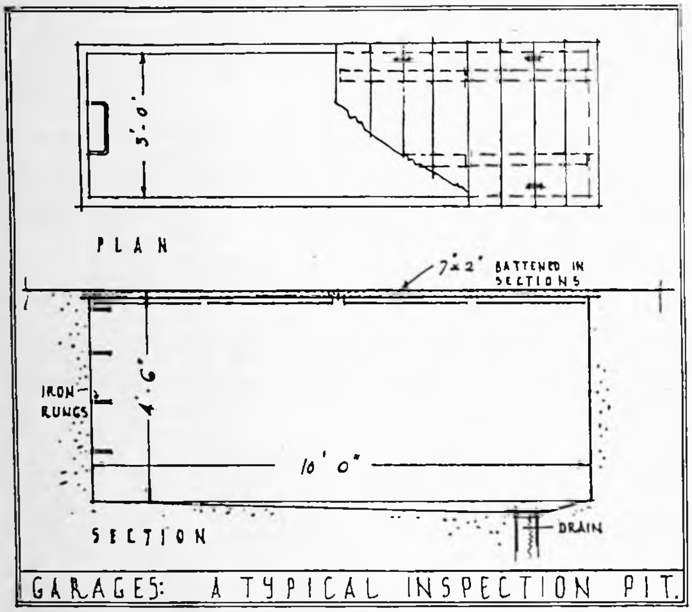


Figure 18

In Figure 19 two pits are shown placed side by side with the area between excavated, and left open for storage of tools, jacks, pressure-gauge apparatus, and general storage connected with the pits.

Battery Service — All garages require facilities for storage and recharging of electrical batteries, and in many areas the accommodation for this department has to be separated from the normal work of the garage by fire-resisting materials and in some cases has to be approached from the external air. The actual charging of batteries and the storage of recharged batteries, together with spares, are sometimes separated into two rooms connected by doors or, if on different floors, by small service lifts. The recharging room is best placed on the lowest floor of the building, so as to provide a solid base for motors when these are required. Care has to be taken to provide proper benches with lead or other acid-proof tops. The batteries are charged on benches or racks, usually placed against walls on which the leads from the motors or mains are fixed. Low racks are needed for the storage of acid and distilled water containers and further racks and bins for spare parts and new batteries.

Services—Compressed air is required for the operation of many types of petrol and oil pumps, as well as for tyre service ; for the latter purpose outlets should be provided in the entrance forecourt and also on each floor level. The motors and compressors for all purposes should be located together, preferably on the ground floor or in the basement and be in a separate room adjoining the garage, cut off by fire-resisting materials. The plant should be duplicated as a safeguard against breakdown.

Water should be provided on each floor for filling radiators and it is also needed for car washing ; the pressure for the latter purpose may need the provision of pumps or be dependent on the height of the storage tank above the car-washing department floor level ; if sufficient pressure is available and it is permitted, connection may be made direct from the supply company's mains. Pumps, if required, should be placed in the basement, though portable machines with flexible connections to water points are now in use. A sprinkler system is installed in many garages ; the water discharged by such a system has the advantage of smothering petrol fires by the elimination of the air necessary for combustion. Sprinkler outlets should be at ceiling level and each should cover not more than 100 superficial feet of floor area. The water supply for the sprinkler system may be taken directly from the local supply mains or through high-level storage tanks dependent on conditions of the supply and its pressure. In addition, fire-fighting apparatus especially suitable for dealing with petrol fires (sand buckets, foam sprays, etc.) should be distributed at frequent intervals throughout garage buildings, particularly near petrol and oil storage and filling departments. Petrol and oil must not be fed into vehicles inside the garage building or on the various floors, but should be supplied from pumps installed at the entrances or exits of the

Figure 19

building. (Petrol and oil services are discussed later.)

In some garages use is made of old oil from the car sumps as fuel for engines to make electrical power for the various local motors required in various parts of the garage, such as for water pumps and air compressors. The motor generators used for running on this waste oil are of the Diesel type, using the oil in its natural waste state after straining to remove any metal or other solid matter and diluted by about 50 per cent with new fuel oil. Ordinarily this waste oil has to be carted away, as it must not be put into the public drainage system.

Construction — There are few special points in regard to the construction of multi-floor garages. Floors should have a specially hardened surface to eliminate dust as far as possible, and should be treated to reduce the possibility of skidding. Garage floors are often marked out in berths with white lines painted on the floors ; such lines can be made permanent by inlaying the lines with white bricks or with different coloured (for example, black) cement strips. Corners of piers and cased stanchions, which are liable to damage, should have metal protection built into the corners for a height of about 3 ft 6 in above the floor.

Pumps—Most of the petrol and oil used by road vehicles is now sold through the medium of pumps rather than in small tins or other containers. The pumps are either hand-compressed-air or motor-operated. The compressed-air pumps are operated by applying air pressure to the storage tank, and the motor-operated either by individual motors to each pump or by a central pump system. The capacity of the discharge of pumps varies from about 7 gallons per minute for hand-operated pumps to 20 gallons per minute for motor-operated ones. Pumps are made with single or multiple discharges up to six brands. The pumps vary in size and shape quite considerably and the type of pump should be settled before designing the size and shape of the curbs, pavements, or bases upon which the pumps may be placed. It will be found, however, that an island on which pumps stand should be about 3 ft wide to allow space on which mechanics may stand without chance of being touched by moving vehicles. Islands, or bases for pumps, should be raised 6 in above driveways as a protection. Pumps are sometimes placed singly or in pairs. Pairs should be placed about 3 ft apart centre to centre and at least 6 ft should be allowed between single pumps or between pairs to allow further standing space both for mechanics and cars. The height of pumps varies very much according to the type. The storage tanks for the pumps must be placed either under the driveways or may be enclosed tanks on the lowest floors. Tanks are usually of ungalvanised steel, cylindrical or rectangular in shape ; they must be underground or enclosed in a fire-resisting container which will hold a quantity of liquid nearly equal to the tank proper in the event of leakage. A manhole cover for access is necessary, together with a filling and a ventilation pipe, the latter carried up well above the ground and fitted with gauze covers. Tanks for petrol vary in size from 250 to 2,000 gallons.

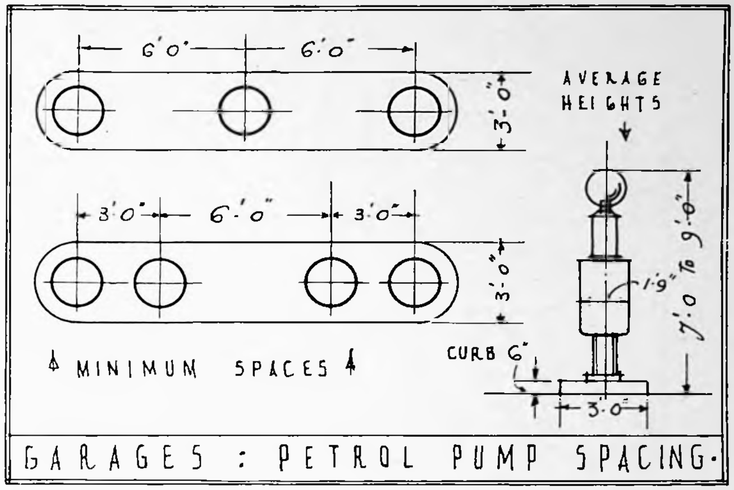


Figure 20

It is possible briefly to summarise the regulations made by the London County Council in regard to the storage of petroleum ; these regulations are fairly typical of the general requirements of other areas and of insurance authorities. If storage is above ground there must be an enclosing embankment or retaining wall forming a container 3 in higher than is necessary to retain the quantity of liquid to be stored ; these walls have to be brick, stone, or concrete of specified thickness and must be given foundations which will prevent leakage of oil ; brick walls have to be at least 18 in thick. No openings even for pipes may be made in the enclosing walls, and pipes have to be carried over the top. If the storage is to be in pits below ground level the walls must be suitable for retaining both the contents and the surrounding earth and also must be given an additional height of 3 in. If storage is within a building it must be on the ground-floor or basement level.

In many other areas pumps and filling caps must be at least 20 ft away from openings to buildings and from the public way. It is an advantage to place the filling pipes in such a position that petrol tank wagons may discharge into them without obstructing the normal traffic of the garage or pump station. In very few areas pumps are allowed inside buildings, but may be placed in set-backs under upper floors or under projecting canopies, which permit of the pumps and the operators being under cover in wet weather.

Hinged and flexible pump arms and pipes swinging across public ways should be avoided and, in fact, are prohibited in some districts.

FILLING STATIONS

Site Considerations—The selection of a site for a filling station should be considered very carefully from the point of view of traffic in the surrounding streets and from the point of view of advertising advantages, as it is essential to be able to see a station some time before reaching it in order to have sufficient time to make a decision on the question of stopping. The best sites for filling stations are frequently much too expensive, consequently less satisfactory ones at low costs have to be used, with the result that site conditions are often very difficult. Town planning and traffic conditions, however, should be very carefully considered in order to avoid damaging amenities and causing traffic congestion, with the consequent avoidance of the station by motorists. The important factors in the design of filling stations are quickness of service, elimination of danger to passing traffic, pedestrians, or users of the station, distant visibility to passing motorists and a clear view of passing traffic for those leaving the station. Thought should be given to the provision of opportunities for the display of accessories in showcases or windows and for the installation of a repairing depôt with all stores and equipment.

Figure 21 illustrates six typical filling station sites and their relationship to traffic in the adjoining streets. In regard to site planning those shown in Diagrams 1 and 2 are similar in relation to the streets, but the essential difference lies in placing buildings on the site. In Diagram 1 the buildings are towards the back of the site, leaving the front

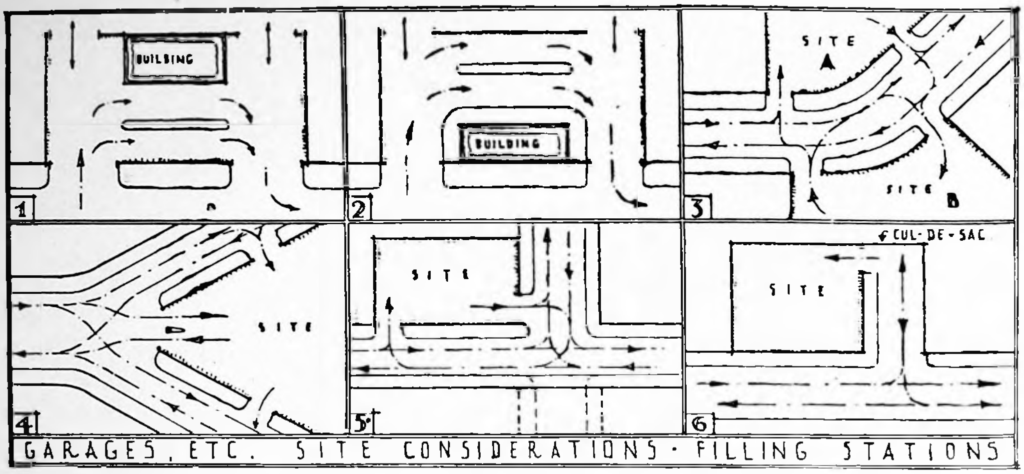


Figure 21

part of the site open, which is good from an advertising point of view and for visibility when entering or leaving the site; the fault, however, is that this type of lay-out is apt to become untidy in appearance unless the design is well handled and the premises well looked after. Type 2 has the advantage of having the road frontage partially closed by the station building. Traffic can circulate more easily on the site because the radii of curves are greater; but the visibility of passing traffic on the road to vehicles leaving the station is bad.

Diagram 3 illustrates two sites placed on the curve of a street. Site A is bad from the traffic visibility viewpoint as well as for advertising purposes, whereas site B is really ideal in every way because both traffic on the road and vehicles entering and leaving the station have a clear view of one another; also this site is very good from the advertising aspect as it may be seen from long distances before vehicles reach the station. Diagram 4 shows a good site for an important station at a road junction; the entrances and exits are easy in relationship to the traffic in all directions. Types 5 and 6 illustrate points which should always be avoided; in the former example the vehicles are discharged from the station in a position which is very disturbing to other traffic, especially if there is a likelihood of the traffic of one road having to wait for that of the other to pass; congestion is almost certain to take place. Type 6 is unsatisfactory as vehicles entering and leaving the cul-de-sac may obstruct one another and cause a hold-up to the main road traffic at the junction; also visibility of the main road traffic is bad for the cars leaving the station, especially if, as is sometimes the case in this type of plan, the cars have to "back out" into the main street.

Planning the Filling Station — These notes are confined to roadside filling stations and the information is not intended to apply to the sale of petrol connected with large garages, although many points are common to both. The important factors to be considered in the planning of filling stations are, firstly, relation to the surrounding streets (considered above); secondly the circulation and lay-out of roadways and buildings on the site together with the placing of petrol and oil pumps; thirdly, whether any sales are to be made in addition to petrol and oil, and if provision for the execution of repairs is to be made. Toilet facilities for both sexes should be provided if possible in all types regardless of size, although this is sometimes difficult to achieve in small stations in rural areas. Entrance roadways should be about 20 ft wide and driveways between buildings and pumps or between rows of pumps should be at least 12 ft wide. When planning driveways from the street to pumps sharp curves must be avoided and consideration should be given to the turning spaces required for the largest car and more particularly lorries. Driveways must be constructed to receive heavy loads without damage to the surface; surfaces should be paved for cleanliness and ease of upkeep. The most suitable paving materials are concrete, asphalt and tar macadam; they should be laid to falls to remove water quickly in wet weather. As previously stated, when the subject of pumps was under consideration, all pumps and buildings should be raised above roadway levels on islands with curbs about four to six inches high to eliminate the possibility of damage. Canopies over islands and driveways are useful as a protection in wet weather, but care should be taken that the driveway on one side of the pumps selling purely commercial vehicle grades of petrol should be left uncovered so that high lorries may use the pumps; the latter is a point frequently forgotten, and it is found that high-loaded lorries cannot approach covered pumps. Canopies should leave a clearance of 9 ft over driveways and should have supports of minimum dimensions to reduce obstruction of pavements. Toilet accommodation should have external approaches in small stations, but in large buildings where waiting rooms are provided the approaches may be from these rooms; it is better that the approach doors do not face the driveways or working spaces, although this

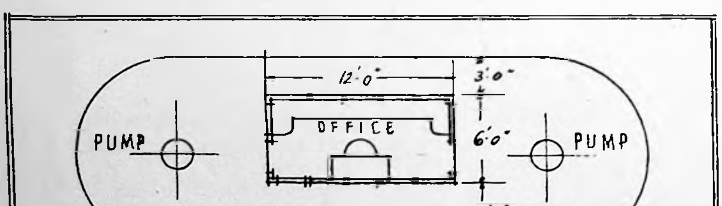


Figure 22

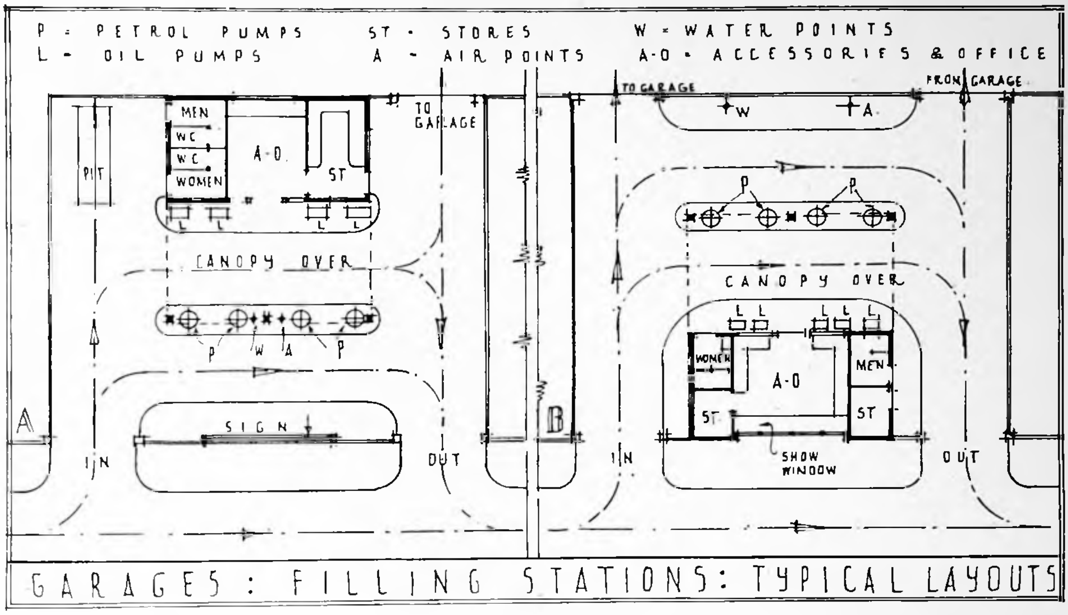


Figure 23

is sometimes unavoidable. Entrances and exits on main roads are better if separated, and should be very clearly marked.

Figure 22 illustrates the "wayside station" often attached to a cottage in outlying areas, and is, consequently, very small, providing only the minimum accommodation in the form of buildings, together with one or two petrol pumps. The office building is just large enough for a desk and one or two chairs, and has accommodation for storage of a few tins of oil, etc., but no space for spare parts or accessories. A water point is necessary, although this may only be a pump or a tap fed from a storage tank filled by a small pump. The positions illustrated for the pumps are well separated so that two vehicles may stand one on each side of the island near each pump at the same time waiting their time for service. The building is planned to give the attendant a full view of the roadway and quick access to the pumps by doors at each end. The station is placed so that the majority of users need not leave the main roadway to fill-up, but if a longer stop is intended the draw in to the other side of the station is used. Filling stations of this type seldom have covered driveways, but the whole island on which the buildings and the pumps stand might be easily and cheaply placed under one roof.

Figure 23 illustrates alternative schemes for the same site. The site is a normal roadside type with other property, either built-up or with open land on either side. Diagram A shows the buildings placed at the back of the site, and Diagram B with buildings adjoining the main road. In Type A the pumps are visible from the road; but this has to be well arranged and carefully kept up to avoid an untidy appearance; the petrol pumps must be set some distance back to permit of sufficient turning space for cars to draw up alongside pumps. Both schemes suggest covering one driveway but leaving the other uncovered for use of high vehicles. Scheme A has the advantage of having a suitable space—as shown on the plan by the pit—for the temporary parking of cars while small repairs are made without interruption of the traffic circulation; this space may be doubled if a garage is not placed behind the filling station and may in either case be covered if desired. In both examples, petrol pumps, water and air supplies may be placed on an island between driveways, while oil may be stored in bins placed under cover in front of the office. Alternatively, in Type B air and water supplies may be separated from the petrol at the back of the site, thus causing less interference with petrol pump users—especially if tyres need attention which may take some time to carry out. The buildings provide similar accommodation, but the toilet facilities are better in Type B, the entrance doors for men and women being separate. Type B has a show

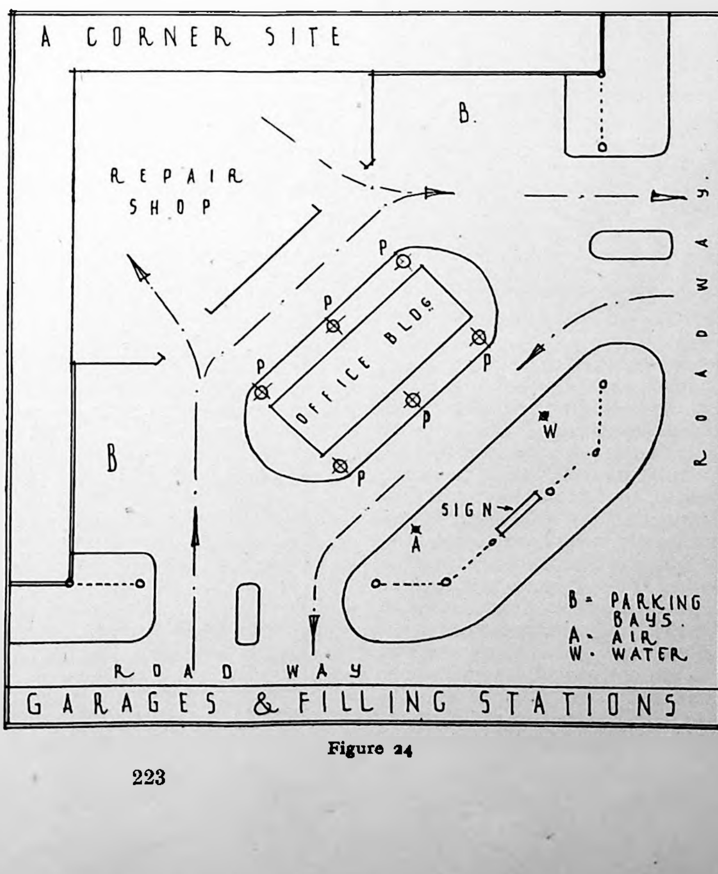


Figure 24

window on the street, but its value is somewhat doubtful, and, excepting for the fact that attention may be drawn to the station by means of a large sign on the roof of the office building, a station where the pumps are mostly hidden from the road by buildings does not attract attention of the passing motorist so easily.

Figure 24 illustrates an example of the treatment of a station placed on a corner site. The building is placed on the diagonal of the site with driveways passing on each side of it ; if the building is placed more forward on the site it obstructs the view of traffic on the main road. It is important that entrances and exits to the site are not placed too near the corner, as they may interrupt the easy flow of traffic in the street. This plan also provides a building at the back of the site, and parking space for a repair shop with good access to driveways.

Figure 25 illustrates a type of filling station plan in which the buildings, pumps and protective roofs are placed at right angles to the street on which the site abuts. Such an arrangement produces a very compact building which is easy and economical to construct, organise and maintain ; it should be placed sufficiently far back on the site to allow space for large commercial vehicles to draw in easily to the outside of the first row of pumps, which is the only driveway not roofed over. The office is conveniently placed for service both to the pumps and to the repair department, and at the same time has full control of the approaches to the station from the street. The toilet rooms are well placed, being convenient but not too prominent. This plan, when placed on a rectangular site, as in the illustration, leaves ample room at the back corners for car parking and washing, and such repairs and oiling as are not executed under cover of the canopy. The corners of the site may also be used for store rooms, compressors and lighting-plant rooms—an arrangement which keeps these units well away from the normal traffic areas. It is also helpful to have such back spaces for tank lorries bringing petroleum supplies to stand while discharging their load into the storage tanks serving the pumps ; when mechanically operated pumps are used, the storage tanks may conveniently be placed away from both the pumps and the traffic-ways.

Canopies—In most districts canopies are not permitted over the public highway or footpath, but this does not affect their use on land in private ownership. It is a great advantage to have both pumps and those parts of the roadways on which vehicles stand during the process of filling covered during wet weather so as to keep both the station employees and customers dry.

The canopies may take either the form of flat or pitched roofs, according to the design and locality of the station, but it is generally easier to collect and remove rainwater from flat-roofed types, as falls may be laid to supporting piers or to the building, against which down-pipes may be placed. It is difficult, on the other hand, to connect a down-pipe against the pier of Type D in Figure 26 to an eaves gutter. It is very desirable that the water is collected and not simply allowed to drip off the roof on to vehicles or customers. Figure 26 illustrates several types of sections through canopies : Type A is a roof placed between a building and a row of posts placed on a pump island, thus one driveway is covered and the other open for use by high vehicles, as the overhang is stopped slightly behind the face of the curb to the island ; this extra overhang does, however, provide protection to the pumps. When cantilever types are designed it is essential to bear in mind that they must either be properly tied back to a building or be balanced by similar loads. Types B and C show canopies covering two driveways ; in Example B both are placed on one side of the office, and in C one roadway is on each side of the building. The positions of pumps in relation to buildings and canopies are shown in each example ; it is important that supply connections between pump and vehicle do not have to cross one traffic-way to reach another. In Example C it should be specially noticed that the pumps have to be duplicated on each side of the building. The accessibility of the pumps is one of the utmost importance and should be considered to be the primary factor in planning the lay-out of a filling station ; quality and rapidity of service are important, but count for much less in the eyes of a casual user of a station than a simple, well-arranged lay-out. The maintenance of the general good appearance of a station may be facilitated by the proper designing of surroundings such as lawns, flowerbeds and trees. Signs and lighting are of the utmost importance because they can aid the commercial value of a station very considerably and must be designed as part of the whole scheme. The buildings generally should have an appearance of efficiency, clean lines and tidiness.

Lighting—Most stations, because they are likely to be used after dark, should attach great importance to lighting both as an attraction of custom and to ensure efficiency and safety of operation. Lighting should be concentrated on the vital parts of

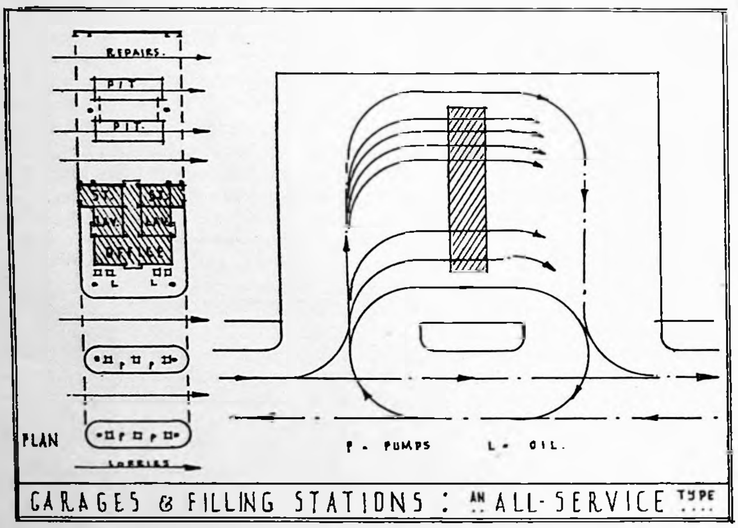


Figure 25

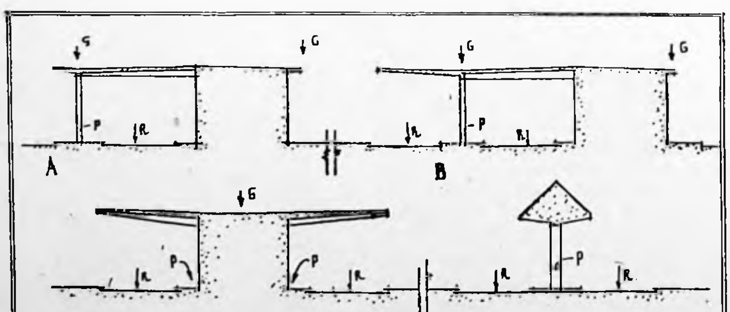


Figure 26

the station such as the pumps and pits, particularly on the former to attract the attention of passing drivers of vehicles. Driveways and approaches should have the same or a greater amount of light than the streets from which the vehicles enter the station. One authority recommends the following intensities of light for different purposes: Pump islands, pits and general working space, 15 f.c.; yards, approach roads, 3 f.c.

The proper diffusion of light and the proper placing of fittings in relation to work surfaces such as benches, pits, etc., are essential.

The exterior lighting of the building as part of the attraction to passing vehicles may be carried out in a number of ways, such as flood lighting, outlining of the building, and by use of street lighting units or lamps on tall standards. The first generally seems to produce the most satisfactory results in the simplest manner; light may be directed where it is mostly needed; glare, and lights shining directly in drivers' eyes, must be avoided. Street lighting units do not produce such a satisfactory result as they cannot be directed on special objects and there is a tendency to glare. The use of bare lamps is usually unsightly and uneconomical, especially if used to outline buildings. Canopies should have ceiling reflectors to light all covered areas. Display cases, showrooms and offices should have adequate lighting of the types suitable for each purpose.

Signs—Signs are an essential part of the design of a filling station and must be properly considered as part of the lay-out scheme and in the detail of the building. Signs have to indicate the existence of the station, its name, entrances, the type of petrol sold and to catch the notice of drivers a long time before reaching the approaches so as to give them time in which to decide to stop. Signs should be visible at least 200 yd before reaching a station.

In some districts regulations have been made controlling the use and design of signs, more especially sky-signs and those which overhang the public highway. The placing of the signs is of the utmost importance, especially as regards their height above the ground. If they are placed too high they are difficult to see from the modern type of motor-car, which is designed very low and with screens giving only comparatively small vertical height; equally, if signs are too low, visibility may be obstructed by pedestrians and other vehicles passing between the signs and the driver.

Signs must be designed both for day and night use. The amount of lettering should be reduced to the minimum and be well spaced. The size of the sign and its lettering depend on the position of the sign and must be varied according to the distance from which it will generally

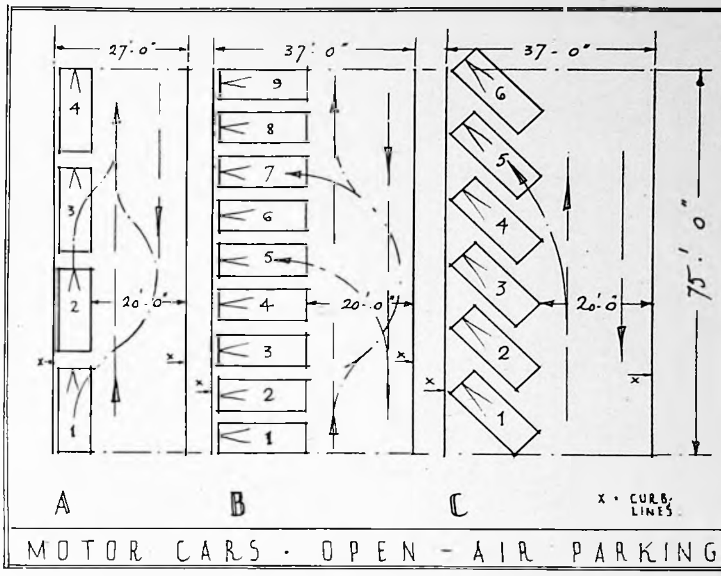


Figure 27

be read. Signs which are very large are often difficult to read. Each brand of petrol should be properly marked so that the driver knows where to go and also signs bearing information or instructions for drivers should be placed near eye-level, or tilted for easy reading and should be placed on the drivers' side of the vehicles.

Filling stations frequently have restaurants or tea rooms attached to them, or the filling station is part of the services of a wayside hotel or road-house. The design of these restaurant buildings is outside the scope of this section, but there is one essential additional factor which does not have to be considered in ordinary filling stations, namely, the provision of a large area of parking space which must not be so placed as to impede other traffic entering and leaving the filling station itself.

Parking of Vehicles—Figure 27 illustrates three methods of parking vehicles in streets or other places against a curb or pavement; all these methods may also be adopted in large car parks attached to clubs, stadia, etc., but in the latter, the lay-outs are duplicated on each side of a marking line. Vehicles should never be placed in double rows on one side of a pavement owing to the difficulties involved in removing a car from the inner row before those in the other row have left. This figure also shows that the method of parking has to vary according to the width of the roadway available in order to leave a clear way at least 20 ft wide, in each type, for turning and for one line of cars to pass each other in either direction. The figure also shows the number of vehicles which can be parked in each method against a given length of pavement. Type A shows cars parked parallel to the pavements; in this type space must be left at each end of each vehicle to permit of any vehicle being removed easily without disturbance to the remainder. This system occupies the least amount of the road width, but accommodates the least number of cars for a given length of road. The cars in Types B and C occupy the same amount of road width although far more vehicles may be parked in a similar length of road in Type B than in Type C. It must be noted, however, that Type B is very disturbing to the ordinary passing traffic on the remainder of the road, as in entering or leaving a berth the vehicle has to be driven on to the other side of the road, thus disturbing both lines of traffic; this difficulty does not arise in Type C, which is by far the easiest method of parking and for entering and leaving the park. Whenever possible it should be laid down that all vehicles park with the front of the cars facing in the same direction, as this eases control greatly. The traffic lines of vehicles entering or leaving berths are shown on the diagrams together with suggestions as to the placing of the front of the cars; these details illustrate more clearly the problems involved in each type.

Figure 28 illustrates a typical lay-out for parking on sites where large numbers of vehicles are expected, such as at clubs, recreation centres and displays (military tattoos, etc.). It is usual to adopt the lay-out shown for the parking of the actual vehicles, which is similar to that shown in Type C of Figure 27, and to direct traffic so that there is continuous circulation between the car berths in one direction only. The rows of berths may be of unlimited length and when there are very large numbers of vehicles signs placed on high posts should be used so that drivers may go quickly and easily to the right section; these signs may be coloured (with coloured lights for night use), corresponding with the colour of

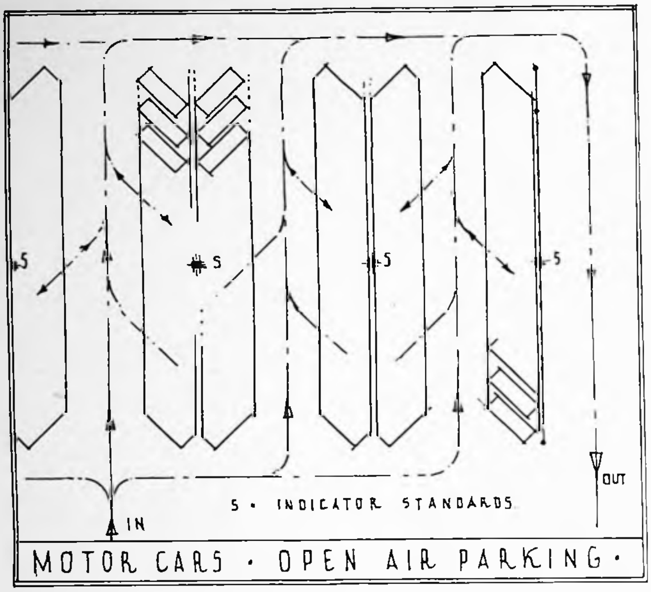


Figure 28

the tickets issued to patrons. If other lay-out systems are used there is frequently congestion after the event; for example, directly a football match is over everybody wants to leave at the same time; the parking system shown permits any car to leave without moving any other vehicle. Car berths should always be assumed to need a space 7 ft wide and 16 ft long with driving aisles 20 ft wide, or rather less if the diagonal lay-out is used as in Figure 27 C, or Figure 28. Car berths based on 16 ft lengths permit the parking of the few cars which are longer than the average without disturbing the normal spacing. It should be particularly noted in Figure 28 that vehicles are not parked on the roadway on the right of the diagram because every car using the park has to use this portion of road, whereas the other roads only carry traffic equal to the number of berths on the two sides of that actual road. A series of berths on the outgoing road would also mean that cars would have to back into the face of oncoming traffic in order to leave the park, which should always be avoided.

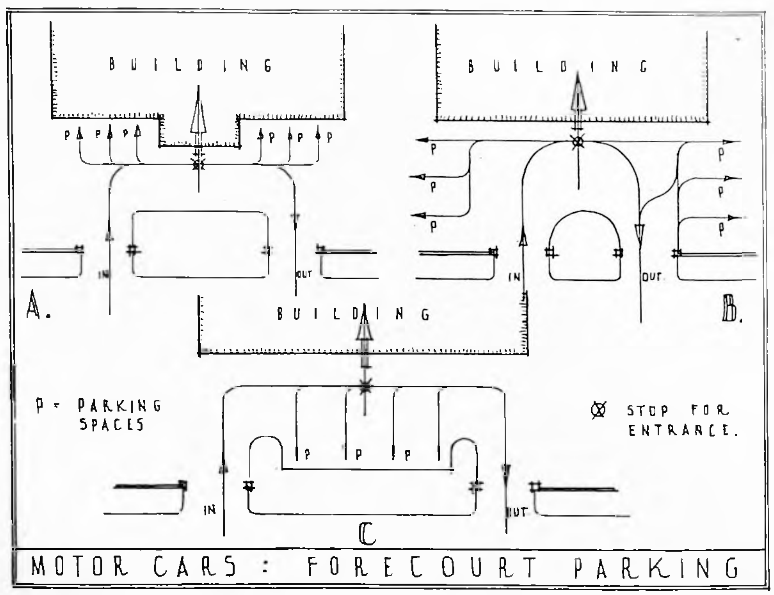


Figure 29

Forecourt Parking—Many buildings are planned with entrance forecourts which provide facilities for parking a limited number of vehicles; also in some instances there are a number of public buildings which provide in open forecourts parking facilities for ceremonial occasions when cars have to drop passengers at a main entrance and be parked by chauffeurs in such a position that they can easily return to the main door to pick up passengers.

It is essential that traffic should travel in one direction only, with the entrance to and from the adjoining street very clearly marked. Entrance gateways, if provided, should not be less than 8 ft in the clear and preferably rather more with separate side gates for pedestrians. Pavement crossings should not be more than 10 ft wide so that not more than one vehicle can enter at a time. The greatest problem arises in the arrangement of the parking in such a manner that any vehicle may come and go without crossing other traffic and having at the same time an easy return for picking up passengers at the entrance. Figure 29 shows three typical lay-outs, but each has the same defect, namely, traffic having to cross other traffic. Diagram A necessitates cars backing (after dropping their passengers) to each of the berths on the left of the building, thus meeting other vehicles as they enter the forecourt, or they have to leave the site and re-enter to reach the parking space; similarly those parked on the right-hand side have either to back up to the door or leave the site and drive round again to the door.

Diagram B shows a lay-out, frequently used, in which the cars are parked at each end of the forecourt, but it suffers from the same traffic defects as Type A and even possibly to a worse extent as the backing problem is greatly increased in distance.

Diagram C is a slightly better scheme but also has its faults; every car must either be backed into its berth against the traffic or be backed after leaving the berth to return to the main entrance to the building, a procedure which is slow, is apt to lead to congestion, and spoils any fine ceremonial effect. The problem does not appear to have a really satisfactory solution.

The minimum sizes of such courtyards are determined by the minimum turning radius for the largest car and, therefore, the radius of the inside curb of any part of the road should be at least 20 ft. Roadways should be at least 20 ft wide so that two vehicles may pass one another easily. Pavements for pedestrians are frequently not provided in schemes of this sort and consequently a general spaciousness must be provided.

Street Parking—Some consideration of the problems arising from the parking of public vehicles, such as taxis, is also required. Figure 30 illustrates two methods of arrangement for taxi ranks which are not generally adopted; the usual method of parking these vehicles is by placing a single row of vehicles in the centre of the road to face one direction, which necessitates the vehicles crossing the traffic to reach either curb to pick up passengers; this is particularly bad when passengers are on the pavement on the right-hand side of the stationary

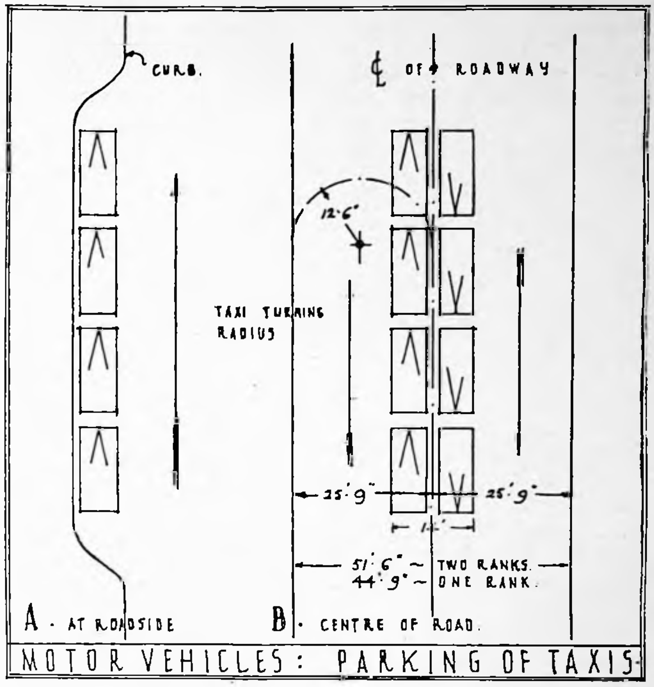


Figure 30

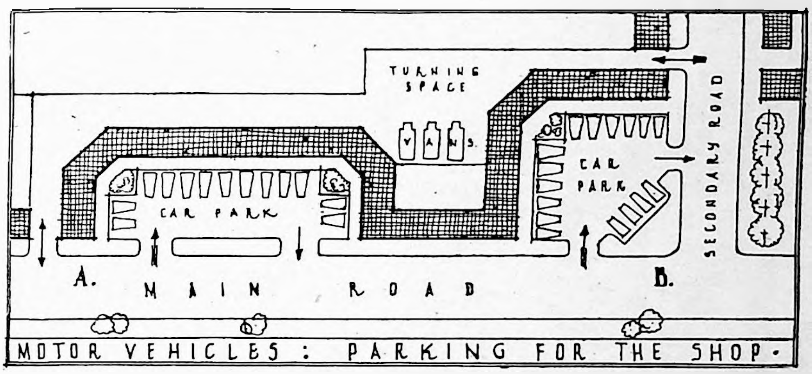


Figure 31

taxis. Diagram A illustrates a parking system which has many advantages, the main advantage being that the vehicles do not impede the normal traffic in the street, as they stand in a set-back in the pavement ; this does, of course, necessitate wide pavements in order to be able to cut off the six feet required for the taxi-stand.

Diagram B illustrates a scheme in which the stand is placed in the centre of the street, but it has to a great extent overcome the difficulties of the single line of taxis facing in one direction, previously discussed, by the duplication and placing of a row of vehicles facing either direction. If this scheme is used, it is essential that the roadway is at least 50 ft wide, to permit a single turn to be made from the rank to the curb as indicated, without any reversing of the vehicles.

Figure 31 shows a suggestion for car parking in shopping areas. This system avoids the interruption of the normal street traffic and also provides considerably more parking berths than can be obtained by parking against a normal straight curb. This lay-out cannot be used for urban areas where site values are very high, but is very useful for suburban districts ; such a lay-out overcomes the difficulty that prevents cars from being used for shopping in many areas—congestion of street traffic. The corner treatment is not only useful in dealing with the parking problem, but owing to the opening up at the junction of the roads, traffic from the side road has better visibility of the main road.

Bus Stopping Places—As an extension of the system of parking for taxis, it is suggested that a similar setting back should be adopted, when the width of the pavements permit, for omnibus stopping places. Traffic would be able to move more rapidly and more easily if 'buses drew off the main traffic-way when stopping to pick up or set down passengers. Such setbacks in pavements should be kept well back from street crossings in order not to interrupt vision from vehicles in one street of those in the cross street ; also if the stopping place is too near the junction of the roads, pedestrian traffic is also interrupted, more especially through not being able to see approaching traffic which is about to pass the stationary omnibuses.

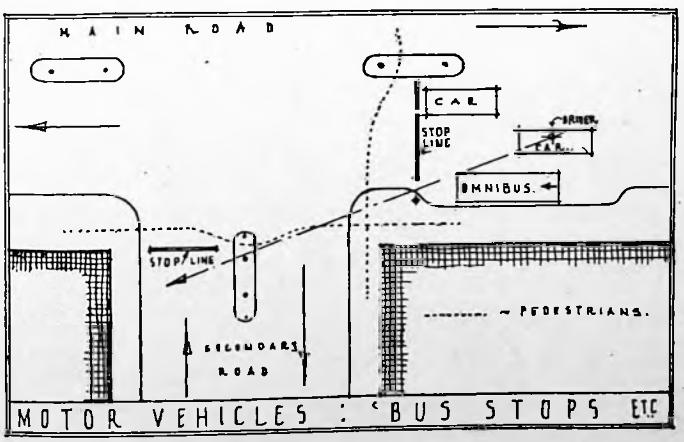


Figure 32

Figure 32 shows the usual positions for street refuges in relation to the pavements at street crossings ; they should be set back from the projected line of the pavement to ease the turns for vehicular traffic, but at the same time they should not be set too far back or they become useless for pedestrians. The figure also shows the positions for " stop lines " which should not be placed farther forward than indicated on the figure, and are better if placed so as to leave the whole width of the island clear for the use of pedestrians when crossing the street.

In starting away from a stop of this sort, an omnibus tends to follow the restarting traffic after the latter has cleared the road junction, rather than to impede other traffic at official stops which are often necessarily next road crossings.

Loading Docks—When commercial vehicles have to load or unload frequently in connection with buildings proper loading docks are of great

value in time and labour saving. Loading docks should have a minimum depth of 21 ft and should be 7 ft 6 in wide; many lorries are of much greater length than 21 ft, and the size of the docks should be suited to accommodate such sizes if they are to be used regularly by very large vehicles. The dock platforms should be from 2 ft to 3 ft above roadway level. The docks should be so placed that vehicles standing in them do not project across and interrupt the normal use of the pavement. (See also section on "Factory Buildings.")

12. *Municipal Buildings*

Introduction — This section is limited to requirements of municipal offices and town halls, although in many towns there are often other buildings, such as police courts, fire stations, libraries and showrooms for municipal undertakings, grouped with either or both of these.

The requirements of municipal offices are in most respects somewhat similar to those of any large commercial undertaking and have much in common in regard to general features. It should always be recognised, however, that municipal offices which contain a council suite will have two main divisions to be considered: (a) ceremonial side connected with the council and its committees and with receptions and civic functions of the Mayor or Lord Mayor, sheriffs, etc., (b) administrative business of the council, the services of the town, and the proportion of government administration allocated to local authorities under various acts or departments. In considering these two main divisions it must always be remembered that, if the ceremonial suite or circulations are being used for civic functions, the administration side of the building must always be able uninterruptedly to carry on its business.

Town halls are in a strict sense, assembly halls for the public. Such halls are used for very varied purposes, as far apart as trade exhibitions, public dances and conference meetings.

Site Considerations—The architect is seldom called upon to select a site for municipal buildings and is, therefore, little concerned with the general considerations of choice of any particular site, but on being allotted a site for such a building there are some important points to be considered in placing the various departments: as, for example, the drawing offices requiring north light and the council and committee rooms a maximum of quietude. The position of the main approach is usually dictated, but secondary entrances must be dealt with in relation to the surrounding streets, in order to make access as simple and direct as possible both for the staff and the public. Town halls must be placed so that adequate means of escape in case of fire may be provided, and these preferably to two separate streets.

Municipal Offices—A municipal office building may roughly be divided into the council suite, five main departments each subdivided into a number of sections and several lesser departments.

The council suite comprises the council chamber, with provision for the press and a gallery for the public having separate access apart from that required for members and officials, the Mayor's parlour with lavatory, members' rooms with cloakrooms and lavatories for both sexes and one or more committee rooms. In addition to these main rooms, lobbies and possibly a reception room are needed.

The main departments are usually those of the accountant, the town clerk, the engineer and surveyor, education and health; among other departments are included weights and measures, gas, water, electricity, parks, etc.

Figure 1 illustrates diagrammatically the main relationship of the rooms and departments to one another. The accountants' department is usually one of the largest, and needs direct access for the public for the payment of rates, and it is therefore generally placed on the ground floor, with possibly a special separate public entrance to the rates hall. The council suite is generally placed on the first floor, together with the town clerk's department, to which the public do not need to go in large numbers. The surveyor's and engineer's department also has only a few public visitors, and is therefore, in addition to the requirement of good north, and, if possible, top-light for drawing offices, placed on an upper floor. The public health department, especially when it has a clinic attached to it, should have easy access for the public. The education department may be placed anywhere in the building, as the public do not need frequent access to it. The weights and measures department should be placed, if possible, on the ground floor, where easy access may be provided for deliveries of heavy loads by vehicles. The position of the service delivery entrance is very dependent upon the surroundings of each site and upon its shape and the number of stories built upon it

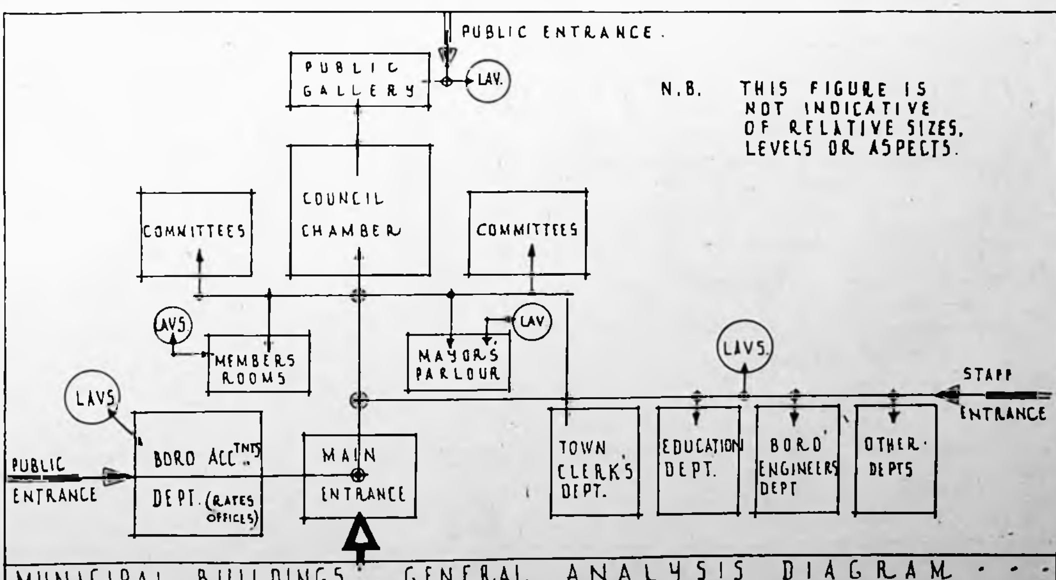


Figure 1

It is, however, most satisfactory if all deliveries such as fuel and stationery, as well as the collection and removal of refuse, all take place at the same locality on the plan, preferably in an enclosed yard.

Entrances—In practically all examples there is one main entrance leading to all departments, but particularly to the council suite; it should be of considerable importance, as it is used on occasions for ceremonial purposes, and it should be approached by ample ways for vehicles and, if possible, preceded by some parking space for cars. The entrance hall should be large and spacious, with the access to the council suite prominently placed. At the entrance should be provision for porters and telephones and for lifts to upper floors. The main entrance, particularly in smaller schemes, is often used for public access to the rates office. Secondary entrances are required for easy direct access for the public to certain departments, for staff use and service deliveries. The secondary entrances, however, should be kept down to a minimum for satisfactory circulation, and in order not to increase unduly the necessary control by porters; the secondary entrances are specially useful for public and staff access to the building when the main entrance is being used for an important function and also serve for escape purposes from upper floors. The secondary vertical communications should be grouped with the secondary entrances, and their positions should be such as to provide rapid communication between the various departments.

Main Entrance—Figure 2 is a diagrammatic illustration of the lay-out required for a main entrance, and illustrates the approximate relative amounts of traffic and its direction through the entrance. The access to the reception and council rooms, although carrying only a small proportion of the number of persons entering the building, should be handled as the most important circulation due to its ceremonial use. The lifts in the main entrance are used to serve all floors both for the offices and the council rooms, but, as these buildings are seldom very high, the use made of the lifts by the public may be small, more especially as departments to which many of the public need access should be placed on lower floors; the main use of the lift is for the council members. In smaller municipal office buildings the porter also answers general inquiries and directs visitors to the various rooms; but in larger schemes a separate inquiry office is generally necessary, in addition to the porters' room, which in such cases may be quite small; in either case telephonic communication is required to all departments.

Main Staircase—The main staircase of necessity must be of monumental character up to the floor on which the council suite is placed, but it may, if desired, stop at that level and the floors above may be approached by smaller staircases. It should have adequate daylight, a factor which affects its place in the plan; it should not be less than 5 ft wide and probably much more; a staircase designed round a fairly large open well is generally more impressive and monumental in appearance than other and more congested types. In smaller buildings it is often more economical to place the staircase hall on the main axis, and the staircase at one side of such a hall. A satisfactory composition may be arranged if the staircase and lifts are placed on each side of a main circulation way as shown on Figure 3, Diagram A, but the lifts do not as a rule require as much space as the staircase, particularly as one lift only is sufficient in this position for most municipal buildings, therefore the remainder of the space can be utilised for telephone booths, porters' office, or similar purposes; staircases are usually better if placed within a separate staircase hall, as shown in

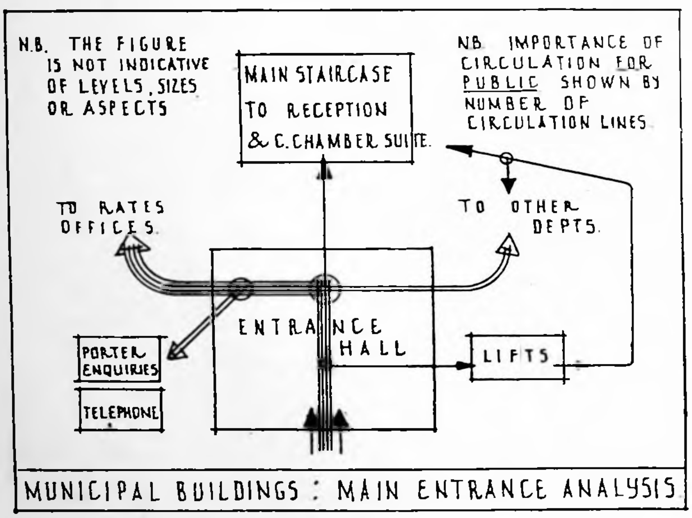


Figure 2

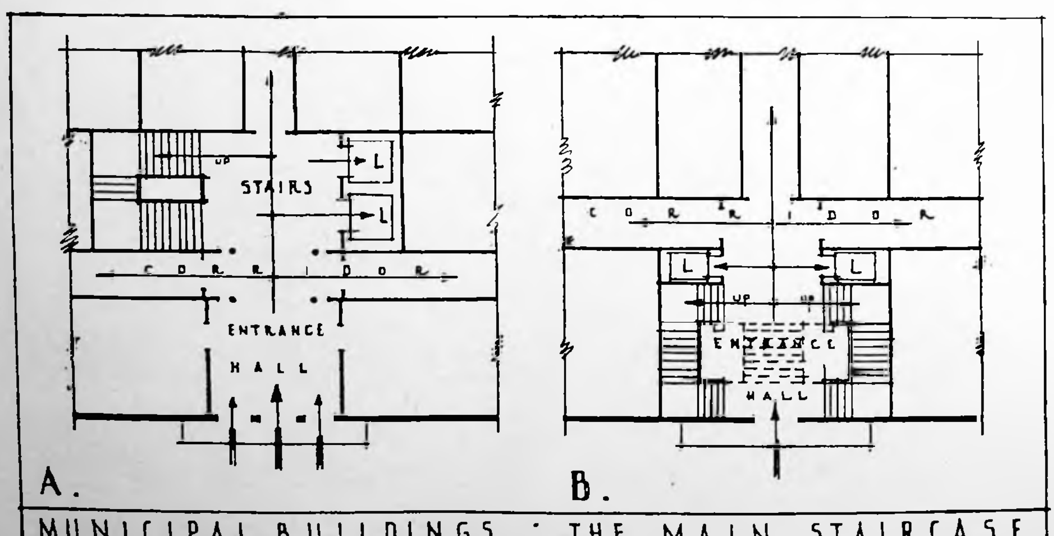


Figure 3

Diagram A, rather than if placed in the entrance itself, as in Diagram B of Figure 3, as there is less liability for the space at the entrance to become congested. The latter method cramps the actual space in which external doors may be placed. The scheme shown in Diagram B is very much more economical in space than the other lay-out, and is particularly applicable to small buildings on congested sites. The position of the main staircase should be obvious and easily accessible immediately on entering the building. The position of the start of the staircase in relation to the entrance doors should be properly arranged, in order that visitors pass up the staircase in a direction that is continuous and not in one which involves hidden turns or any return in the direction of the external doors. A further point of general planning consideration in regard to the main staircase is its relation to the main circulation corridors on the various floors; it is better to place the main corridor, if possible, between the staircase and the entrance to avoid congestion and the crossing of the staircase circulation by the many visitors to the ground floor departments.

Secondary Staircases—The secondary staircases should be continuous from the basement through all the floors. They should be of fireproof construction, in order to serve as escape staircases, unless they are only for use as inter-departmental communication; cut-off doors should be used on each floor level, properly arranged so as not to obstruct the circulation. These staircases need not be elaborate in finish or decoration, but should have good daylight and ventilation, which implies that they should be placed against external walls. Staircases should not be less than 4 ft wide, and, therefore, cannot be placed within the widths of and parallel to corridors which are less than 8 ft 6 in wide, unless the space is increased in width, as shown in Figure 4, Diagram A. In many schemes it is better if the staircase is placed at right angles to the corridor, as shown in Diagram B; this position often permits the placing of staircases in the angles of buildings and leads to easier fenestration lay-out.

Corridors—Corridors communicating with the council suite and similar important rooms should not be less than 8 ft wide, and are frequently more, with an average of about 9 ft. Ordinary corridors serving the office portions of the building should be from 6 to 7 ft wide, except when very short in small buildings, where they may be reduced to 5 ft. The height of corridors should not be less than 8 ft 6 in, but they need not be as high as the adjoining rooms, thus permitting the upper parts to be used for ducts and similar purposes; care should, however, be taken in regard to the height of window heads in corridors of less height than the adjoining rooms, as a

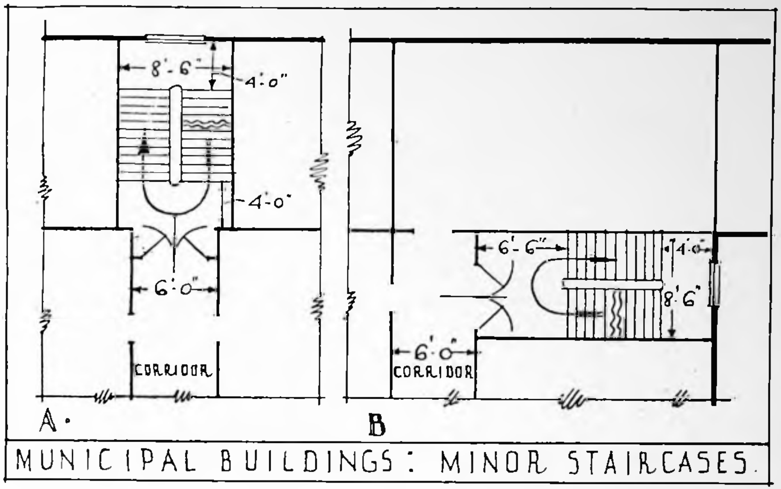


Figure 4

continuous level on the elevations may be difficult to arrange. It should be noted that provision is made in both the diagrams in Figure 4 for the cut-off doors to swing clear of the normal circulation on the staircases, in the case of Diagram A the doors are set back and in Diagram B the normal 4-ft landing is increased to 6 ft 6 in to allow 2 ft 6 in for the door swings.

Council Chamber—The council chamber is architecturally the most important room in a municipal building and must, therefore, be treated as the climax of the plan. It is usually placed on the first floor level and should be given a quiet position away from traffic noises. To overcome problems of noise transmitted through windows, council chambers may be top lighted, but this system affects the planning considerably, since it cannot then be built over on any higher floors. The council chamber has to provide accommodation for the mayor, deputy mayor, aldermen and a place for clerks and other officials, the ordinary members of the council, and for the press and the public. It is approached by at least two doors from the members' lobby, which is virtually an ante-room, often in the form of a large recess off the main circulation and not necessarily cut off from it to form a separate room. Adjoining the members' lobby are placed the members' rooms, of which two are now essential, as in most councils there is an increasing proportion of women members; to each members' room should be attached cloakroom and lavatory accommodation. The placing of the seating for the various users is the primary factor in the planning of the council chamber. Figure 5 illustrates three different ways in which the necessary accommodation may be arranged in mass without the detail considerations such as the actual shape of the room and the seating lay-out. The first decision to be reached is the placing of the mayor in relation to the entrance doors to the chamber. There are, in the main, two alternative positions as illustrated in Diagrams A and C, as compared with B; in the former the mayor has to walk the length of the room on entering, but less trouble is created by the coming and going of members during the meeting, as they are nearer the doors; also the doors are in full view of the mayor when seated, whereas in the latter example the mayor is close to the entrances, but the members passing in and out may be disturbing. These alternative general lay-outs affect very materially the placing of the press and the public accommodation, which may be in various positions as shown by the diagrams; in Type A the public is placed in a gallery over the members' lobby, which is approached by a staircase adjoining the main circulation and from which secondary escape may be provided into the corridor on the floor level over; the press are placed in the council chamber itself near the doors on the council room floor level, from which position they have easy and rapid access to the members' lobby without disturbing the meeting; Type A is economical in floor area and approaches. In Type B, in order that the public shall face the mayor's chair, the gallery has to be placed away from the remainder of the building, thus necessitating additional construction, particularly of staircases; it is also disadvantageous to have the press crossing the entire length of the chamber to obtain access to the members' lobby, as they sometimes need to do during the progress of meetings, without causing undue disturbance. Type C is somewhat similar to Type A, except that the public and press galleries are placed on either side of the council chamber, which may, unless special care is taken, be detrimental to good acoustics. The ideal position for the press is undoubtedly near the centre of the central well of the chamber, but this position is generally disapproved of by local authorities, as it is disturbing to have the press passing through the seating

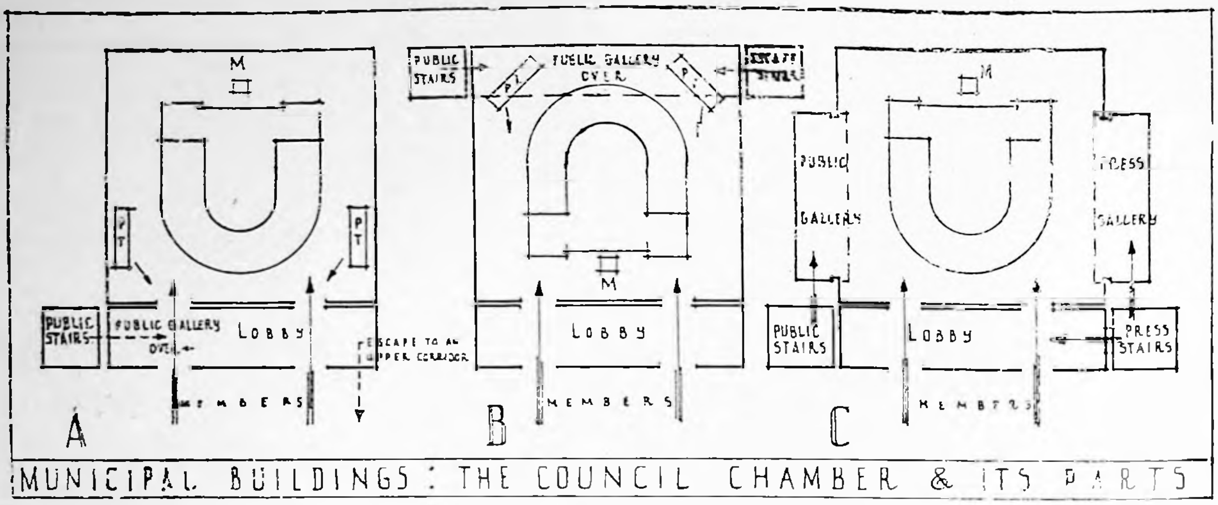


Figure 5

to the lobbies, etc. Galleries for the public or press should have at least 10 ft clear space between the general floor level of the chamber and their under side. It is important that the public is not in too close proximity to the members and for that reason seating for the public is not desirable on or close to the floor level of the chamber, as might be easily arranged in a plan on the lines of Type B.

After the position and general shape of the council chamber have been decided, there are certain details which must necessarily receive consideration with regard to the lay-out of the room itself and the designing of its details. It is usual to step the seats for the councillors towards the centre of the room, an arrangement which results in a clear space being left in the centre at a lower level than the surrounding parts of the floor. Around this well are placed the seats on the one side and the dais with desk and seats for the mayor, deputy mayor and town clerk on the other In large and medium-sized council chambers the floor of this dais will be at the same level as the floor surrounding the seating for the councillors. In small chambers, however, the dais may have to be raised a step or two as the number of tiers of seats for the councillors would be insufficient to raise the dais to any appreciable extent. Ample space should be left between the walls of the council chamber and the seating for the members. As already explained the floor space in the angles of the room, if the seating is arranged on any sort of semi-circular plan, can be used for the Press tables. Tables and seating for the clerks are required and these are usually placed in the middle of the well of the chamber, where the clerks are within easy hearing of all proceedings and are able to make accurate notes. It has become unusual to separate the aldermen from the ordinary members unless the council is very large. Not more than six seats should be placed in a continuous row, and preferably only four seats. That is to say, no seat should be more than two or three seats from a gangway. Gangways and seating space should be ample, as it is necessary to ensure that members may rise and leave the council chamber without disturbing the meeting unduly. The horseshoe or semi-circular type of lay-out is now the most common practice, and several variations in detail of this form are shown in Figure 6. In Diagram E, Figure 6, however, is an alternative form which is sometimes adopted, in which the benches are placed on opposite sides of a central well. This arrangement has certain objections in that it divides the council rather

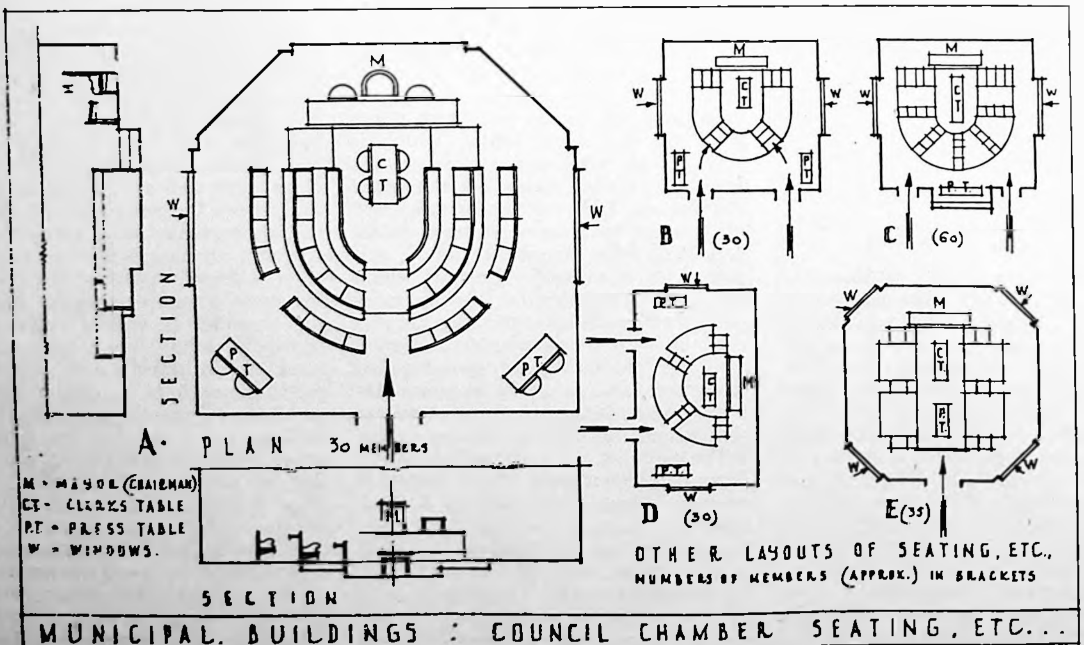


Figure 6

definitely into two parties, and this may not prove to be convenient in all cases. In addition, such a plan may incline members to address each other across the room and not to address the chair. Figure 7 shows diagrams and sizes of typical council seating based on an average of many recent chambers. About 4 ft should be allowed between the seats from back to back and at least 2 ft 3 in should be the minimum seat width from centre to centre of the arms, which are usually provided. A desk or flap is usually fixed to the back of the seats of the row in front and may well be sloped slightly and contain inkwells, space for pens, etc. This writing slab should be wide enough to take foolscap paper, and should not be too high, 2 ft 4½ in being about the right height ; the provision of ample knee-room is required, and this should be carefully watched where drawers are provided beneath the writing slab. It will be seen from the diagram that as much space as possible should be provided between the front of the seats and the edge of the desk or writing slab ; this is essential, making as it does for easy entrance or exit from any seat. The floor levels are usually arranged to drop about 3 in for each row of seats, but this may be increased up to a maximum of 1 ft 2 in, or two 7-in steps per row of seats. Fixed desks with movable armchairs are used as an alternative to fixed seating. This arrangement allows room at the back of the chairs for exit, the space between the chairs being about 9 in to allow for a certain movement essential for entry and exit. The platform table for the mayor, deputy mayor and town clerk is placed on the dais and should be of ample length, as it is often necessary to place large volumes, minute books, records, etc., upon it, and the accumulation of papers during a meeting may be considerable.

The Position of Entrance Doors to the Council Chamber should be carefully studied. It will be seen from Figure 6, Diagram A, that only one door has been provided and thought necessary for the council chamber, which in this case is a small one. In Diagrams B, C and D, two doors have been provided, and it will be readily recognised that such an arrangement provides the easiest access to the gangways as here planned.

With regard to the windows of a council chamber, these should be in such a position that the light from them will not shine into the eyes of the chairman and, on the other hand, the members should not be made to look towards the windows when addressing the chair. It is seen, therefore, as in Figure 6, that windows are usually best placed on the side walls. This is a little difficult in the type shown in Diagram E, where the best position is suggested to be in the angles of the room. It is often wise to provide windows for council

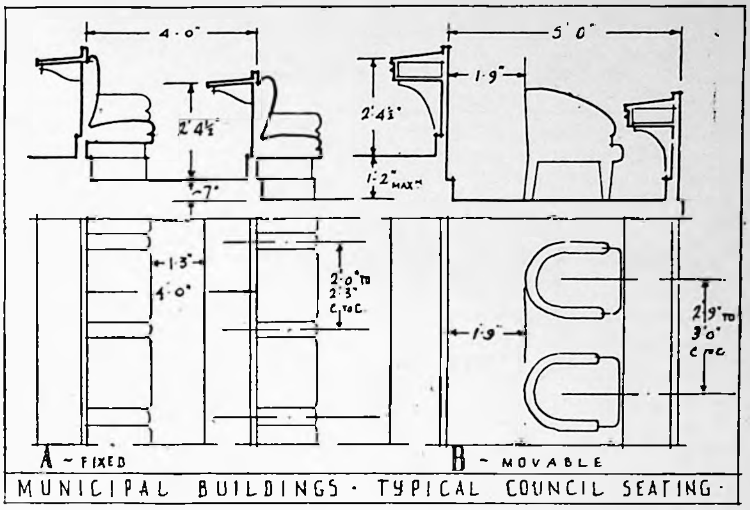


Figure 7

chambers, even though the room may be already well lit from a top-light ; this is suggested to overcome any feeling of oppression which may be caused by the lack of windows in a room which is used for long periods at a time. Artificial light should, if possible, be from some general source flooding the room and if skylights are used, indirect or semi-indirect lighting may well be arranged behind the large laylights of the ceiling to flood the room fully. The switches for such lighting are sometimes arranged to be operated by dimmer controls so that the lights may be switched on gradually as the daylight diminishes.

Local lighting for each councillor's place and for the platform seats and clerk's table is sometimes provided in large types of council chamber, but it should, in all cases, be kept well hidden and well concentrated on the desk or table, and not allowed to shine across the room into speakers' eyes.

In furnishing the council chamber, it should be borne in mind that furnishings can assist the general shape of the chamber to obtain the best results acoustically. It may be that only a small number of members are present at a given time and to assist the acoustics it is usual, in fact necessary, to provide for carpeting over the greater part of the floor area.

Among the primary acoustic considerations of this room should be its position in relation to noise from the streets surrounding the site ; a quiet internal position should be allocated to it, but if, by any chance, it is essential for it to abut on to a street, windows should not in any circumstance be provided on that side. Council chambers must have good acoustics both for the room when full and also when only a few members are present ; speeches may be made from any seat in the room and must be heard clearly in all other seats, including, in many cases, seats placed behind the speaker. To satisfy these special requirements. the chamber must be carefully designed both in plan and section. Figure 8 illustrates five good typical

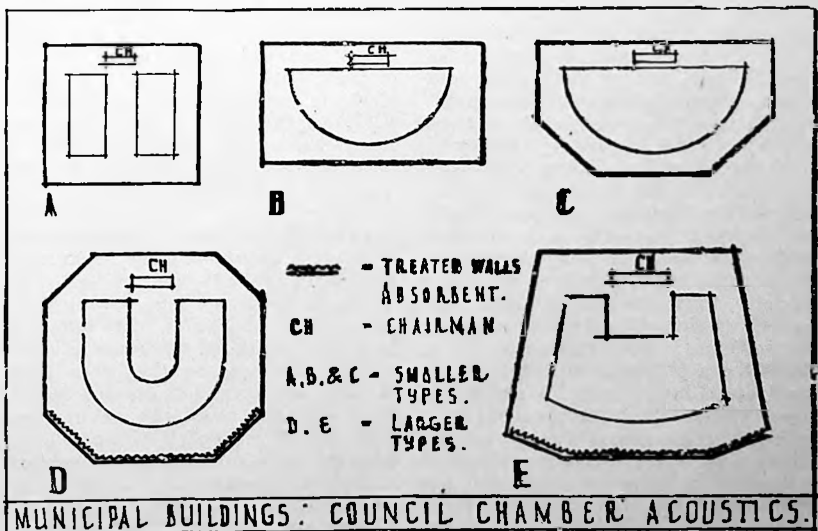


Figure 8

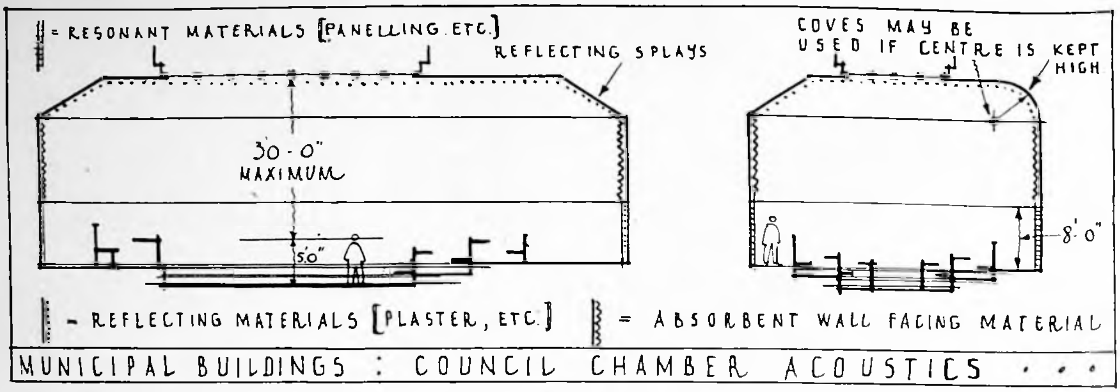


Figure 9

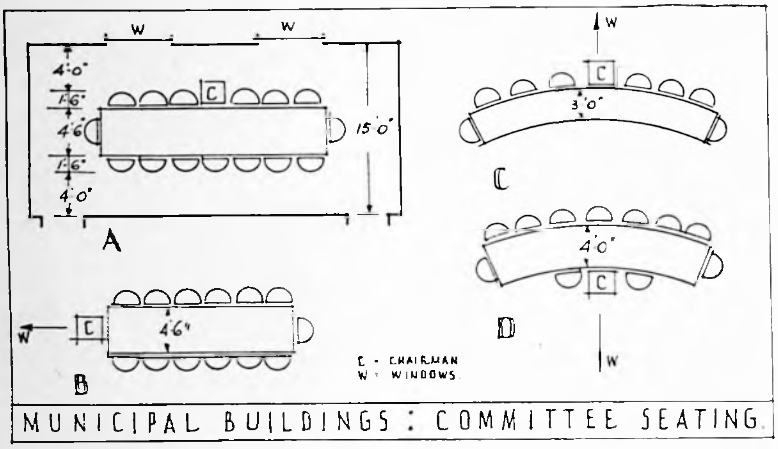


Figure 10

plan shapes for council chambers of varying size. One of the problems needing special thought arises from the large volume of the room compared with the number of persons in it, especially when calculated for a quorum only ; this volume being large, additional absorbents are required to reduce reverberation, but, when possible, the volume should be reduced as much as it is reasonable, having regard to the general design (Figure 9). Ceilings, therefore, should not be placed more than 30 ft above the speakers, they should be flat for at least 75 per cent of their area, and be of a reflecting material ; the remaining portions of the ceiling may be splayed or coved to reflect the sound towards the centre of the room and to divert it towards listeners placed behind the speaker. Floors should be carpeted to act as additional absorbents and also the upper parts of the walls should be soft or absorbent plaster, particularly opposite the mayor's chair, while the lower part of the walls, for a height of 8 ft to 10 ft, should be a reflecting surface such as wood panelling. The placing of the press tables so that the reporters may have perfect hearing is also important ; this is generally difficult to achieve if the press accommodation is in galleries and they should, therefore, be allotted seats on the floor of the chamber wherever possible. Public galleries should not be placed in deep recesses, but should be wide and shallow without obstructions such as columns. It is frequently desired to use top-light for council chambers and so long as the glass laylight is part of a flat ceiling it will not affect the acoustics to any appreciable extent. Special care should be taken in regard to mechanical equipment of the building, such as lifts and ventilation ducts and fans, in order not to cause noise in the council chamber. Windows, when used, are best if of heavy metal construction, in the form of casements, glazed with ¼-in plate-glass in small squares, or double windows, in wood or metal, insulated from each other and placed with as large an air space between the two windows as possible.

Committee Rooms—Figure 10 shows typical seating arrangements for committee rooms. It will be seen that where committees are arranged on both sides of tables, the minimum practical width of the room is about 15 ft, whereas, on the other hand, if they are arranged on one side of the table the room can be narrower but will of necessity cover a larger area for the same number of members. The sizes of tables, etc., are also shown on Figure 10. Tables should allow 2 ft 6 in run per person. The furniture is, of course, movable, but in most cases the tables are made in sections for easy handling and for possible adjustment for larger or smaller committees. The chairman should be placed so that he sits with his back to the light, as far as is possible.

The committee rooms of the council suite should generally be arranged to be inter-communicating and it will often be found that one of the rooms is best planned for use as a possible general reception room for civic occasions.

Committee rooms should, if possible, be placed in quiet positions ; this is frequently impossible and the rooms may have to overlook busy streets, when double windows are essential. The floors should be carpeted over the whole area, both to produce an absorbent and to reduce the noise of persons walking about. The walls, above a resonant dado of wood about 4 ft 6 in high, should be covered with absorbent materials. The ceilings should have reflecting surfaces and be either flat or coved, provided that the centre of the curve is well below the floor level. Hard-top tables are reflectors from ceilings.

An important problem in connection with committee rooms generally arises from the necessity for having movable dividing screens between two or more of the rooms. One of the most satisfactory methods of reducing sound transmission between the rooms is to provide heavy wooden folding doors, bolted to the floor, with the addition of a thick curtain on at least one side of the doors, preferably on both.

Council Suite—The council chamber and committee rooms, which are the rooms of major importance, have been already considered above, but the general relationship of the remaining rooms to each other and to the main rooms remains to be discussed. Figure 11 illustrates in diagrammatic form the chief circulations which are necessary.

Public Gallery—The public gallery should have separate access either from the main entrance or from a special entrance and an alternative means of escape is desirable ; this becomes essential when the seating

accommodation is large or at all isolated. The seats should face the mayor's chair and should be arranged, if possible, in two or three rows only; this is not usually difficult, as the numbers are generally small. The seats should each have a reasonably good view of the members and should be sloped or stepped according to their height above the floor level of the council chamber. The seats are generally in the form of benches, fixed (to avoid noise), allowing about 1 ft 8 in run per person and spaced 2 ft 8 in apart, back to back, while it is desirable that there are not more than ten seats in a row between gangways, to permit of reasonably easy access. A space about 5 ft wide is desirable behind the back row of seats, for circulation and for attendants to supervise the gallery.

Mayor's Parlour—This room is used as a private office for the mayor, and should consequently be planned and furnished accordingly. It should be situated near the council chamber, committee rooms and town clerk's office, more particularly the last two, as there are many more committee than council meetings and the majority of the business is done in consultation with the town clerk. There is often a private lavatory attached to the room and a lobby or cloakroom for robing, or at least a large cupboard for the storage of robes, etc. In the larger cities the mayor often has a small room adjoining for a private secretary.

Sheriff's Room—In buildings for cities where there are sheriffs, it is necessary to provide a room for their use; it should be near the mayor's parlour.

Members' Room—The members' room is used in common by all the members of the council, except that in recent years a separate room has usually been provided for lady members. These rooms usually adjoin the members' lobby or ante-room to the council chamber, although their greatest use is in connection with the committee rooms. The robing rooms should adjoin the members' rooms and more generally consist of large cloakrooms; lockers or wardrobes are required, but often they are movable rather than built-in fixtures.

The cloakrooms, lavatories, robing rooms and members' rooms should be arranged *en suite* for each sex in a manner such as that illustrated in Figure 12. In deciding the number of W.C.s which should be provided, it is doubtful if the lady members of any council would amount to more than one-third of the total number of members (at any rate, at the present time), and a general provision of one W.C. for every ten lady members, with a minimum of two and one W.C. with urinal accommodation for every twenty male members is usually found to be adequate, although a more generous provision is desirable. Lavatory basins should be provided in about the same ratio as the W.C.s.

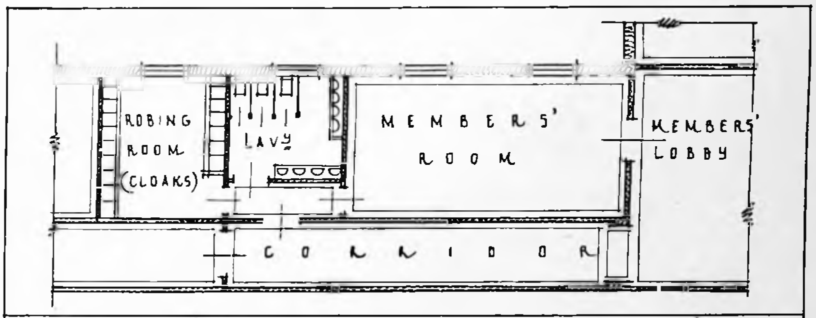
Waiting Room—A waiting room for the use of small deputations attending council or committee meetings is sometimes required, but need only be a small room of about 250 sq. ft.; it is used more particularly in connection with the committee rooms.

Kitchen—A small service kitchen is very frequently required in connection with the council suite. It does not, as a rule, need to be large or elaborately equipped, as it is mainly used for serving tea, coffee, and light refreshments to the council and committees. A room of about 100 to 150 sq. ft. is generally adequate, fitted with a sink, boiling rings or urns in larger buildings and shelving for the storage of china, etc. It may be placed in an unimportant position in fairly close relation to the members' and committee rooms. A small refreshment room for members, to which this kitchen is attached, is frequently provided; this avoids serving meals in the members' common rooms and it should therefore be placed close to these rooms.

Library—A small library for the keeping of minutes, by-laws, acts of parliament, etc., is usually needed in the larger municipal buildings; it should be placed where it is fairly easy of access for members, but more particularly for the mayor and town clerk, part of whose department use it for reference purposes. A room about 150 to 200 sq. ft. is usually sufficiently large.

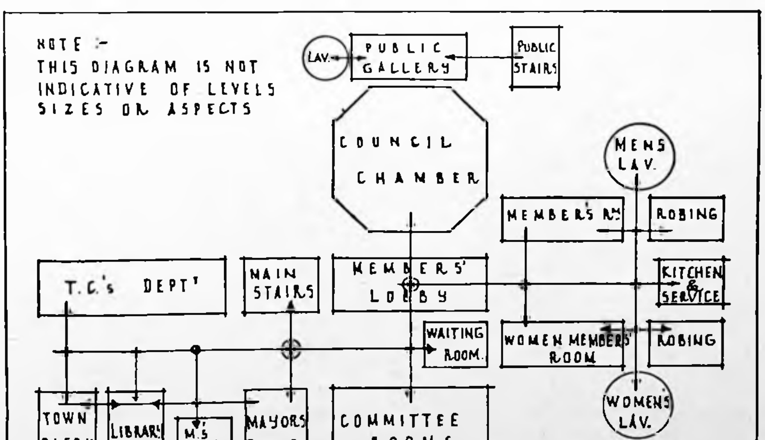
Reception Room—Many councils require a reception room in conjunction with the council suite, whether or not an assembly hall is provided as part of the whole scheme. Where there is not an assembly hall, the reception room is frequently placed at the head of the main staircase and *en suite* with the committee rooms, but when there is an assembly hall, the reception room is often placed so as to form an approach to the hall from the council suite for use on important occasions.

Balcony—A balcony placed on the main façade or overlooking a space in which large crowds may assemble is a general requirement in all municipal buildings, from which public announcements may be made on occasions such



MUNICIPAL BUILDINGS: A TYPICAL COUNCIL MEMBERS' SUITE.

Figure 12



MUNICIPAL BUILDINGS: ANALYSIS OF COUNCIL SUITE

Figure 11

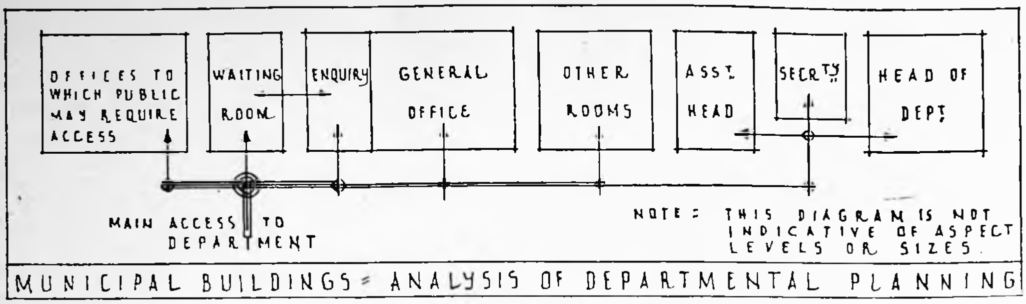


Figure 13

as elections. The balcony should be placed on the first-floor level, approached from either a committee room, the reception room, or a staircase landing. It should allow a clear space at least 3 ft wide and be long enough to accommodate at least ten or twelve persons comfortably.

Departments—The rooms which comprise the various separate departments must be planned to produce good and efficient office accommodation in order to ease the administrative circulations as much as possible. Rooms should not have a greater depth from the window wall than 20 ft, and probably not more than 18 ft, to permit adequate light being available for the whole area and also to provide rooms of reasonable shape. Office corridors should be not less than 5 ft, and preferably 6 ft wide, the latter permitting the easy introduction of wide double doors for subdivisions of corridors.

The general lay-out of all departments should be based on that shown in Figure 13. Rooms requiring access by the public should be placed in the positions most accessible to entrances and staircases; rooms for heads and assistant heads of departments should be placed away from rooms to which the public go; also private secretaries' rooms, when needed, should adjoin, or be planned *en suite* with the heads' rooms.

Treasurer's Department—The treasurer's or accountant's department is a section of the office accommodation which requires early and careful consideration, as it is one of the largest departments, and because the public need access to it in considerable numbers for the payment of rates, charges for licences and charges due to any municipal undertaking, such as the supply of gas, water or electricity. These supply undertakings are sometimes administered as separate concerns having their own individual offices, but more frequently, in recent years at least, their accounting offices have been amalgamated with the remainder of the municipal accounting for ease and economy of administration. Of the rooms in the treasurer's department, the rates office is of major importance from the public point of view, as it is in this space that all the payments and inquiries with regard to payments are made. The room should be easily reached from the main entrance, or from a special separate entrance, but in either case there should be no doubt about its position to visitors to the building, who should be discouraged as much as possible from wandering into other departments, noisy traffic thus being confined to one part of the building. The rates office is generally similar to an ordinary banking hall, divided by a counter into parts, one for the public and the other for the clerks' working space. Sometimes only a small room is provided, wide enough for the public space, and a counter with about 5 or 6 ft behind it (just sufficient for the clerks to work), the remainder of the office space being either screened or completely cut off Normally, however, no separation is made, and the public space and counter are arranged in a large room in which also work a large part of the accountancy staff. The room must be sufficient in area to provide for a counter to accommodate adequate clerks' desks and equipment, each of which requires 5- or 6-ft run. The room generally forms a fairly large proportion of the department and, owing to its size, frequently needs top—in addition to side—light for the proper daylighting of the central part; in the past the rates office has often been placed on the ground floor under a first-floor council room, but this position makes top-light impossible, and its omission would limit the span of the room to a figure below that desired for the council chamber above.

Figure 14 illustrates four typical plans of rates offices, two—A and D—for small schemes and two—B and C

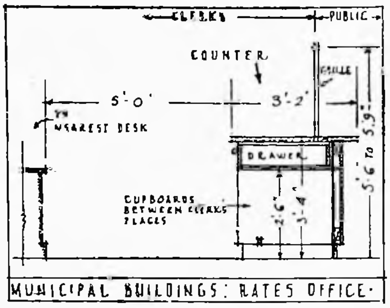


Figure 15

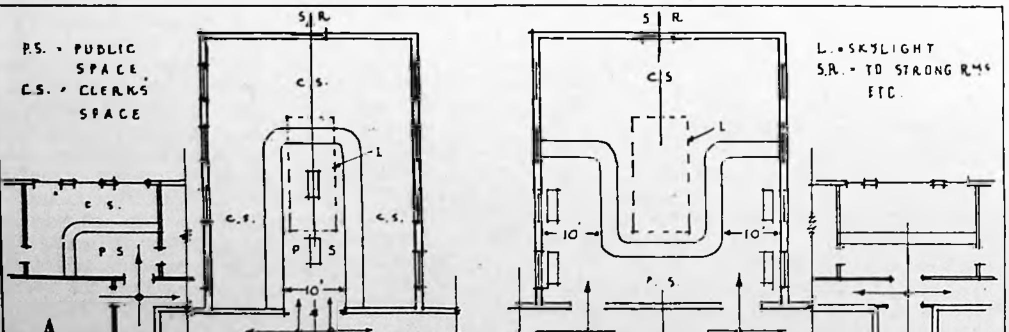


Figure 14

—for large buildings. The counters in both the small examples are arranged so that the public face the light and the clerks therefore have it behind them. Diagrams B and C show alternative placings of the public, in B they are arranged in the centre, so that working space for clerks is available on all three sides in the space nearest to the windows; desks may be satisfactorily placed either parallel or at right angles to the windows according to the space needed; the clerks should be close to the counter clerks with whom they have to work. The counter placing of Type C is satisfactory for large schemes where a great length of counter space is needed, but, owing to the span required for a room providing at least 10-ft widths in the two public spaces and adequate working width for the clerks the lay-out is not, as a rule,

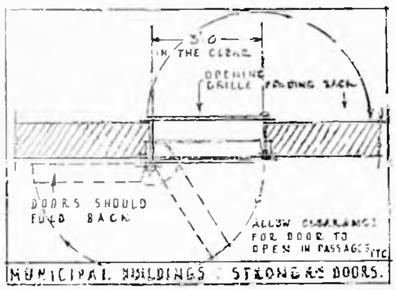


Figure 16

economical for medium-sized schemes. The public have rather more circulation space in Type C, but any advantages from this are counterbalanced by the less convenient lay-out and lighting of the clerks' space.

The public circulation space should not, except in very small offices, be less than 10 ft wide and never less than 8 ft. Counters at which clerks work are generally about 3 ft wide and about 3 ft 4 in high; they are equipped with grilles between the clerks and the public, so placed as to permit writing facilities on the public side. Figure 15 illustrates the more important features of the normal counter-desk fittings.

Strong Rooms—At least two strong rooms are needed in connection with the treasurer's department, one for cash and the other for storage of books and papers. These rooms are either placed adjoining the rates office and on the same floor, or in the basement, and connected by means of a book lift to the department. Strong rooms are not generally placed on outside walls, but proper ventilation must be provided for them. Special care should be taken when planning the entrances to strong rooms, as the doors open outwards and are generally wide enough to provide at least a 3 ft clear opening for the passage of book trolleys; passage-ways must allow for door clearance, or approach lobbies should be planned (see Figure 16). The walls of internal strong rooms are at least 1 ft 6 in thick if in brickwork, or 12 in if in reinforced concrete; in both cases reinforced concrete ceilings and floors are now usual.

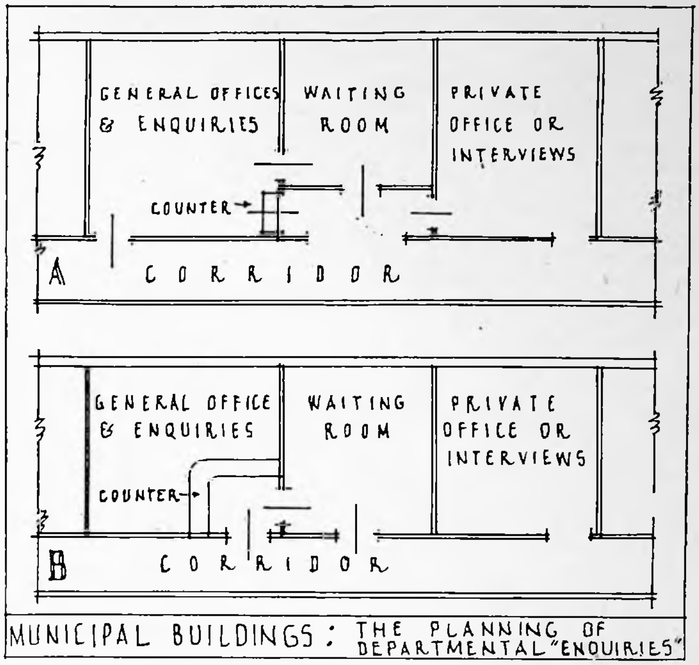


Figure 17

Of the other rooms in the department there is very little in the way of special planning required; an interview room may be required near the rates office, or the general clerks' office and is also certain to be needed in connection with the valuation section of the department. The valuation section of the treasurer's office is sometimes only a part of the large general clerks' space, but is often a separate room adjoining the rates office. The deputy treasurer should be placed reasonably near both the rates office and the general office, which he will probably have to control; whereas the treasurer's office may be placed separately, as he is controller of the whole department. Some authorities, however, prefer to have heads of departments and their deputies adjoining one another.

In the larger districts a room is usually allocated to the auditors, which may be placed almost anywhere in the department. Rooms for such apparatus as addressing machines are sometimes needed and are often placed in the basement because of their weight, and to isolate their noise.

Book-keeping machines, if used, are generally needed in the clerks' space of the rates office, or in a room adjoining and every effort should be made to reduce the resultant noise by the proper treatment of the walls and ceilings.

Inquiry Rooms—Figure 17 illustrates two methods of planning departmental inquiry rooms in connection with a waiting room and a private office or interview room. In Type A a small counter or inquiry hatch is placed between the general office and the public inquiry space, which is a portion of the waiting room separated by a partition or screen: directly off this leads a door to the private office or interview room. The alternative scheme B has no access other than by the main corridor to the interview room. Another common arrangement is to combine the inquiry and waiting space and form it by partitioning off a portion of the general office; the interview room may then either be approached through the general office, or be placed on the opposite side of the waiting space.

Engineer's and Surveyor's Department—The general arrangement of this department should follow the lines suggested previously for the lay-out of all departments. The public need access, in limited numbers only, to a few rooms, mainly the departmental inquiry office, building inspector's office and the estate management office, if the authority owns sufficient property to need a separate office for its administration. Although in many schemes the department is placed on the ground floor (or at least those rooms to which the public need access) it is more general in larger schemes to place the department on the upper floors. It is often convenient to plan the building inspector's room adjoining the departmental inquiry and waiting rooms. In addition to the offices for the normal officials, there are a few rooms requiring special consideration, such as the drawing offices, which should have north-light if possible, either by means of roof or side windows, the former being preferable, though not

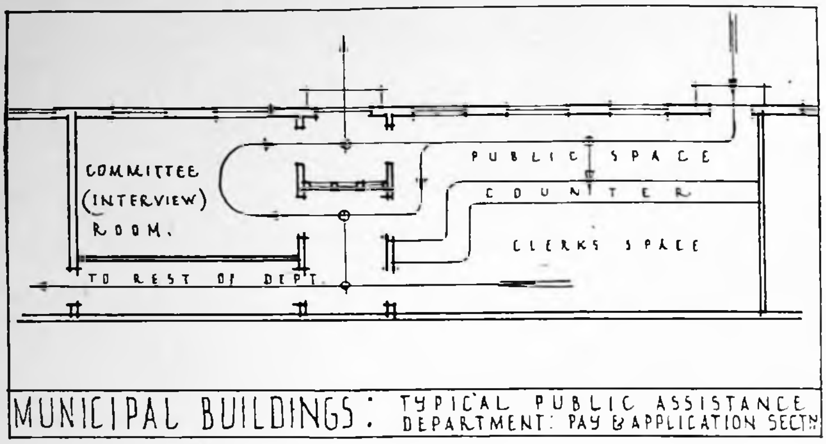


Figure 18

essential. A photo-printing room is often needed, and may be placed in an unimportant position, preferably near the drawing office; this room does not necessarily need good daylight, but it must have good ventilation, ample space for handling large sheets of paper, both on tables and in the sink and have one wall free for a drying rack. In large departments a special room, to which storage should be attached, is sometimes needed for testing sample materials. Large storage for plans and documents is usually needed, partially in the form of strong rooms, one of which, for the storage of plans, is frequently, in small districts, attached to the building inspector's room.

Town Clerk's Department—This department is generally placed on the first floor in order to adjoin the council suite and the town clerk's private office should be placed near the mayor's parlour or office; otherwise the department is laid out in the usual way. In addition to the normal departmental accommodation, it is usual to have a special office for the preparation of voters' lists near the department; the public assistance administration is also generally under the control of the town clerk, although organised more or less as a separate department. Figure 18 illustrates a typical lay-out of the pay and application section of the public assistance department, which should have its own separate access from a secondary street into a hall which serves the purposes of waiting room, inquiry office and pay room. Sometimes separate waiting halls are provided for each sex arranged on each side of the main committee or interview room. Additional offices may be required for the relieving officers and their staff and these are planned much in the same way as is generally required for other departments.

Public Health Department—There are often two parts to this department, first the administrative side and secondly a clinic, although when the latter is provided it is often in a completely separate building. The public needs access to the inquiry office in small numbers, but in large districts it is usual to provide a separate entrance to serve the department. A small laboratory near the medical officer's room is frequently needed and although elaborate equipment is generally unnecessary, an amply lighted, cool and well-ventilated room is essential. The plan requirements of a clinic are outside the range of this Section.

Education Department — This department is again generally provided in two parts, namely, the administrative offices and the juvenile employment office. The former is straightforward office planning and may be placed in any position in the building, but the latter should have special consideration; a separate entrance is desirable from a secondary approach into an inquiry space, adjoining which should be placed two waiting rooms, one for boys and the other for girls; easily accessible to these waiting rooms should be placed the employment officer's room (or rooms, separate for each sex, in large districts). Each section, for boys and girls, should be easily supervised by the official in charge—and glazed screens are often required between rooms to make this possible (see Figure 19). Occasionally an interview room for the use of prospective employers is needed.

Sundry Other Rooms—There are a number of other rooms which are sometimes required according to the particular district. These include publicity and information bureaux, which are usually needed in seaside and health-resort towns; offices for management of waterways, parks, allotments, etc. In many towns rooms are included for the registrar of births, marriages and deaths. The registrar is usually most satisfactorily placed on the ground floor adjoining one of the minor entrances. There is usually an office for the registrar and sometimes a separate marriage room. All these sundry rooms are, except for the marriage room, purely for office purposes and should be planned as such.

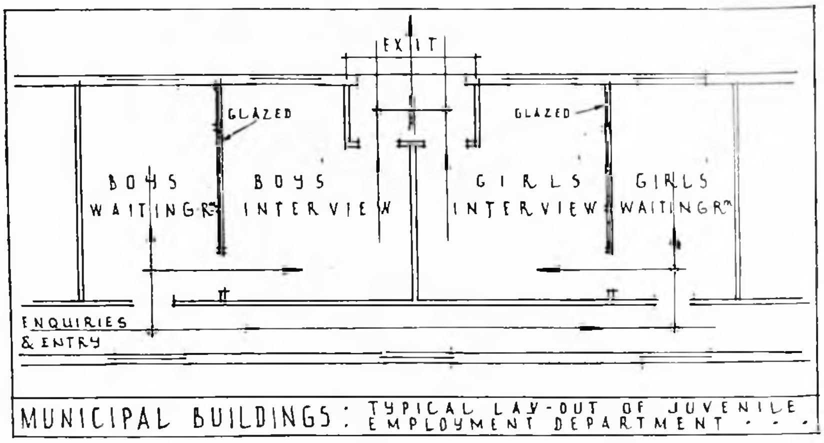


Figure 19

General Office Considerations—There are a few important facts which should be carefully noted in regard to the sections of the office portions in municipal buildings. Floor heights in the parts of the building used for offices should not be less than 10 ft from floor to floor, and are much better if 12 ft, which permits of a more satisfactory clear height from the floors to the under side of any beams in the ceiling.

The sill heights of windows should also be considered in relation to the use of the rooms in which they are situated; in the case of ordinary offices, sills should be at least 2 ft 9 in above the floor, or about 3 ft 1 in or 3 ft 2 in to the glass line, while in drawing offices sill heights should be at least 3 ft 3 in above the floor. The windows, particularly the opening parts, should be carried up to as near the ceiling as possible to provide good ventilation and the maximum of light at the back of the rooms (Figure 20).

In the past, few special precautions have been taken to reduce noise in ordinary rooms used for office purposes but there are undoubtedly some simple considerations worthy of note, such as the avoidance of hard plasters for

walls and ceilings, special absorbents on ceilings and the upper parts of walls in rooms where machines such as typewriters and addressing machines are used. Floor coverings are also worth some thought, as materials such as thick linoleum, cork carpet, rubber, and some composition floors, are less noisy than the usual wood blocks, although possibly more expensive.

Corridors—Much disturbing noise emanates from corridors in office buildings for similar reasons to those outlined above for offices, more especially when fanlights are placed over doors and when light partitions and screens are used as the divisions between the rooms and the corridors; similar consideration should be paid to the choice of floor covering.

Corridors should have at least 8 ft 6 in height in the clear, preferably 9 ft, at which levels false ceilings may be placed in order to form ducts for ventilation, pipes and other services, as illustrated in Figure 20; these ducts may be used both for ventilating the rooms themselves by an extract system and for the corridors themselves, where rooms occur on both sides.

ASSEMBLY HALLS

Assembly halls attached to municipal buildings have to be designed for a variety of uses, such as dances, stage plays and public meetings. In most cases it is desirable that the hall, although connected to the offices should be capable of being let off separately and it should, in all cases, be so planned that the office routine is not disturbed by any functions which may take place in it. The main approaches should be separate from those to the offices, but a connection between the two is generally required and this frequently takes the form of a reception room so that the mayor and the councillors may reach the hall by means of an easy and open circulation. The placing of this connection from the council suite to the hall presents a difficulty as to whether the approach should be from the entrance or foyer end of the hall or at the platform end, as on some occasions, such as political meetings, direct approach to the platform without passing through the hall is required, whereas on other occasions it is preferable that the mayor enters from the foyer. Assembly halls are generally controlled by the regulations governing "places of public entertainment." In the L.C.C. area, and in many other licensing districts, these regulations give minimum seat sizes, gangway widths, number and size of exits, seating, while in most other districts similar requirements are demanded.

Seating—As the hall has to be used for such varying purposes, a flat floor is desirable, with movable seating. The seating in the gallery, however, is generally fixed. The L.C.C. regulations give the minimum seat sizes with back and arms as 2 ft 4 in deep and not less than 1 ft 8 in wide, but where backs and arms are not provided the minimum sizes are 2 ft deep and 1 ft 6 in wide. These minimum sizes are generally found to be rather small and a more suitable size is 2 ft 6 in by 1 ft 10 in for tip-up seats. Chairs are occasionally used for buildings of this type and they should be battened together in lengths of not less than four chairs.

Gangways—The L.C.C. regulations require seating gangways to be not less than 3 ft 6 in wide, and it is generally wise to make them at least 4 ft. The number of seats between gangways is also given by the regulations, which require that seats should not be more than 10 ft from a gangway, which means, with the L.C.C. minimum seat, that not more than twelve seats can be placed in a row with a gangway at each end, or six seats when there is a gangway at one end only; the number of seats in a row may possibly be increased to thirteen and seven on the assumption that the 10 ft is measured from the gangway side of the seat to the gangway itself. If, however, the space in front of the seats exceeds the regulations width of 1 ft, the distance from a gangway may be increased and consequently more seats placed in each row between gangways. Figure 21 illustrates the width of halls as dictated by the varying numbers of seats and position of gangways based

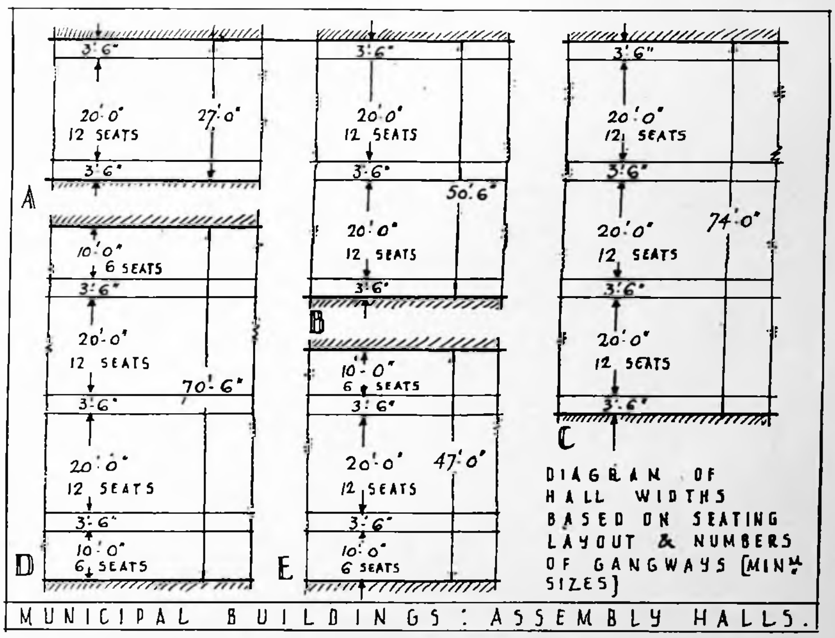


Figure 21

on L.C.C. minimum seat sizes. Diagram A shows a single row of seats with a gangway on each side. Diagrams B and E show the same number of seats, twenty-four, in each row, but with the gangways differently arranged and consequently varying the span of the hall. Type E is generally considered the better, as there is no centre gangway. On the other hand, if a centre gangway is not provided, on important occasions, the mayor or distinguished visitors, if walking the length of the hall, have to do so by means of a gangway not in the centre of the audience, so that the centre gangway has advantages on ceremonial occasions. Diagrams C and D

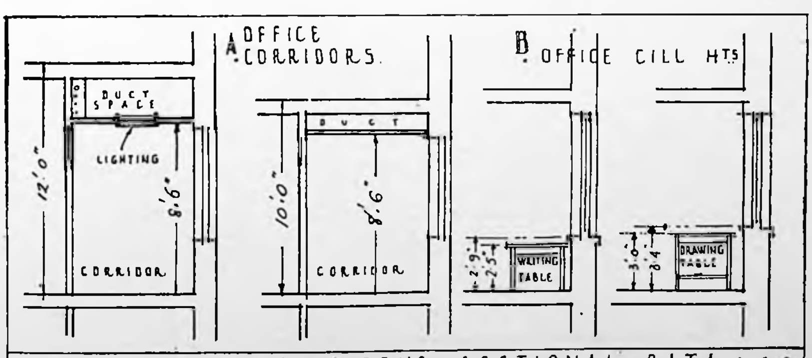


Figure 20

also illustrate more seats in each row, but in this case it will be noticed that D, which has the smaller span, has also a centre gangway. Adequate space should be allowed between the platform and front row of seats ; this should not be less than 5 ft, and preferably rather more.

Storage of Seats—If seating is to be movable, proper storage must be provided in close proximity to the floor of the hall. Frequently, this storage is arranged under the platform, with access doors in the riser, or face, of the platform.

Galleries—Galleries must not have a greater slope than 35 degrees, but a lesser angle is more satisfactory for the arrangement of gangway steps. A minimum clear height of 10 ft is required at all points above and below the gallery. If a gangway is placed behind the last row of seats it should be at least 5 ft wide. Guard-rails not less than 3 ft 6 in high above the floor level must be provided on the balcony fronts, or resters in front of gangways ; the resters themselves depend on the angle of vision, but should have a handrail above them about 2 ft 9 in above the floor level of the gallery. Fire authorities generally prefer the direction of gallery exits to be on the level or upwards towards the rear of the gallery, rather than towards the stage.

Figure 22 illustrates these points, but is based on an angle slightly less than 35 degrees. It will be noticed that when the angle is great intermediate steps between the various levels of the seating become necessary and the rise becomes more and more unwieldy as the angle approaches the maximum.

Exits—The L.C.C. regulations require that each tier or floor of such a hall shall have at least two separate exits if not more than 500 persons are to be accommodated, with an additional exit for every 250 or part of 250 persons above 500. The alternative exits from each part must deliver into separate streets or ways ; one of the exits may be the entrance to the hall, but the others must be alternatives leading as directly as possible to the external air by means of corridors, staircases and doors at least 4 ft in width when there is accommodation for less than 300 persons and at least 5 ft when there are more. The corridors, when finished, must be the clear widths required by the regulations, and be constructed of fire-resisting materials. The L.C.C. prefer inclines to be used, instead of steps, so long as the gradient does not exceed 1 in 10, but, if steps are used, a flat space 5 ft wide must be placed at the start of any staircase and a similar space is desirable at doorways. No projections exceeding 2 in are permitted in corridors or passages.

Staircases—These should be the same width as corridors. The L.C.C. also state that winders are not permitted and flights must have at least three steps and not more than sixteen steps each, nor must more than two flights be used without a turn and, if two flights are used without a turn, not more than twelve steps may be used in each flight. Staircases must be of fire-resisting construction and, unless of reinforced concrete, must have solid square steps—not spandril shaped in section—while landings must be at least 6 in thick, unless of reinforced concrete. Treads must be at

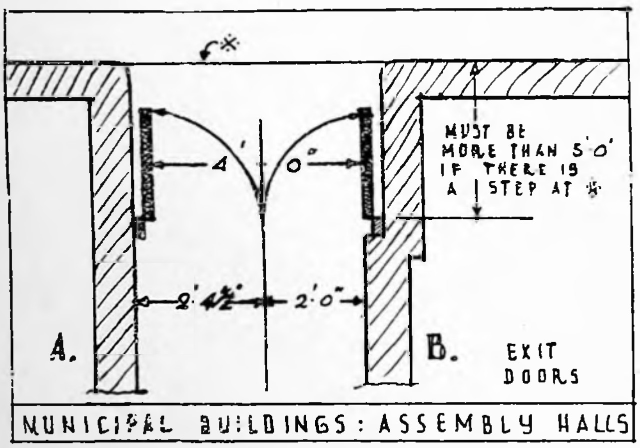


Figure 22

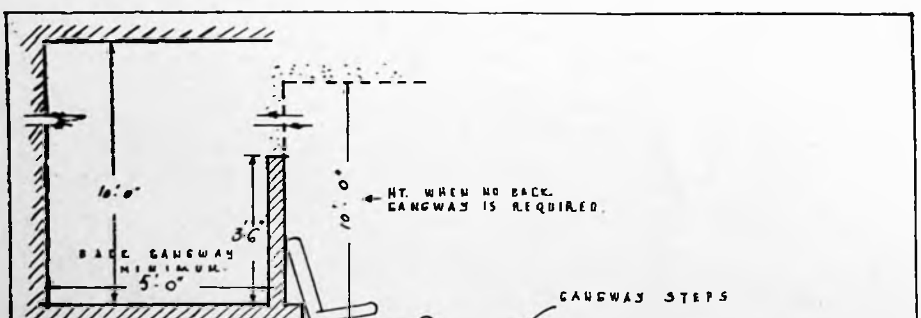


Figure 23

least 11 in wide, and risers not more than 6 in. Treads and risers must be the same size in each and every flight used by the public. Continuous handrails must be fixed on each side of all steps and landings at a height of 2 ft 9 in above the steps or landings, and at returns and the newel wall must be chased at its ends, so as to allow the handrail to turn without projecting into landing spaces. All landings must be at least the width of the flight of stairs.

Doors—Doors should be made to open outwards, but must be so hung as not to obstruct, when open, any gangway, passage, staircase, or landing. If doors are to be used for entrance as well as exit, at least one of the leaves should open both ways. Doors must not open on to steps without at least a 3-ft landing as shown in Figure 23. Revolving doors are not allowed.

Platform—The most suitable size for the platform is not easy to determine, owing to the various uses to which it has to be put; this size is often dependent on its use for an orchestra and choir, which require 10 sq. ft. and 7 sq. ft. per person respectively. Platforms should not be less than 15 ft deep, but this is much too small for theatrical performances, and 20 ft to 25 ft should be provided; the width is usually governed by that of the hall itself, less the width of an exit on each side of the platform. The stage sides should be splayed for acoustic reasons and should be of permanent fire-resisting construction; a fire curtain is sometimes provided in a proscenium opening for theatrical performances. An entrance door on to the stage should be provided on each side, but this is better placed towards the front in order to allow the use of removable stepped seating when the hall is used for orchestral purposes; an entrance is also needed at the back of the stage for theatrical performances. When the stage is to be used for theatricals it is general to reduce the stage size with curtains and scenery in order to screen the necessary back and side circulation spaces and this implies a proscenium type of stage design. The general requirements behind the platform are a green room, orchestra room and dressing-rooms for both sexes. The dressing-rooms are often only one room for each sex, with lavatories and W.C.s attached. The green room is best placed at the same level as the stage, but the dressing-rooms may, if desired, be placed on other levels, though they must be easily and quickly accessible to the stage. Platforms are usually 4 ft to 4 ft 6 in above the hall floor level.

Projection Room—In a hall of this type a single projector is usually sufficient, and this requires a room about 10 ft by 8 ft, though it might be desirable to use two projectors, which would require a room about 15 ft by 10 ft. A rewinding room, about 50 sq. ft., with a hardwood bench, should adjoin.

The projector room should be completely cut off from the hall, and have two separate means of escape, one of which should be directly into external air. The rewinding room should have separate escape without re-entering the projector room. The regulations governing "Exhibition of Cinematograph Films" are frequently relaxed to some extent for buildings of this nature, but as far as possible it is wise to conform to the regulations, as the fire risks are equally great. Direct ventilation by means of a window or top-light to open air is desirable.

Sanitary Accommodation — The L.C.C. make the following provisions for sanitary accommodation in buildings of this type: *For males*:—one W.C. for the first 200, two up to 500 and three up to 1,000, with the addition of one urinal for every 100. *For females*—One W.C. for the first 100, two for up to 250, three up to 500, with an additional one for every 400 above the first 500; for the purposes of these regulations it is assumed that the public consists equally of males and females.

Natural light by means of windows or skylights is generally preferred.

Lighting for Halls—Halls are required by the L.C.C. to have natural lighting by means of windows or skylights, to which suitable curtains and shutters have to be provided, in order that, during performances, meetings, etc., the windows and skylights may be obscured if desired. Artificial ventilation is often essential.

Kitchen—A kitchen is generally required in connection with assembly halls, together with adequate service rooms, which are used for the service of banquets, and for light refreshments in connection with dances, whist drives and similar entertainments; cooking to any large extent is not usually required, as the meals are prepared elsewhere.

(See also section on "Community Centres," for halls, stages, etc.)

NOTES

13. *Law Buildings*

Introduction—This section considers the essential factors in connection with the planning of the various types of buildings as required for the administration of the law; it is proposed to review this subject from the smaller village policeman's house to the larger type of court house, excluding only such buildings as central criminal courts and similar buildings of which one or two only may suffice for the whole country; although, in point of fact, the planning of such large schemes is, in many respects, very similar to other and smaller court buildings, with, however, much larger public spaces and more rooms for administration purposes.

Courts may be divided into two main types; firstly, those dealing with criminal cases, and secondly those for civil cases. All criminal actions are first heard in Police Courts, from which the case may be committed to Borough, County or Quarter Sessions or to the Assize Courts; the court to which the case proceeds is dependent on the type and seriousness of the offence. An appeal may be made to the Courts of Criminal Appeal. Civil cases are heard at the High Courts and the County Courts, from which appeals may be made to the Appeal Courts and finally to the House of Lords. (See Figure I.) There are also certain other types of court for which special buildings or rooms are sometimes provided, for example, Juvenile and Matrimonial Courts, and Coroners' Courts.

In towns where Assizes are to be held it is usual to have two courts and sometimes three; one court is mainly used for civil cases and the other for criminal cases, although both are generally equipped alike to serve each use if so required; also in many districts the Municipal Police Courts are also used for County Court purposes. Police Courts are not often held in the same building as Assize Courts, although in many areas the Police Court and County Court may use the same building. It is difficult to give precise planning information as to accommodation without knowing for what purposes the courts are to be planned; there is much variation in the number and size of the rooms to be provided in addition to the actual court rooms themselves for each type of court. For example, in Assize buildings the rooms are of necessity much more numerous than in local Police Courts. Police Courts are often attached to main police stations and police offices, and have only a few essential rooms for the magistrates and witnesses in addition to the court room itself, as the cells and police offices, etc., form part of the Police Station.

POLICE STATIONS

Since the police station is the building which is most closely connected with everyday life, it is proposed to discuss the planning of buildings for this purpose and then to proceed from this to the various types of court buildings.

Police stations generally comprise rooms both for police administration and the temporary detention of prisoners; frequently, in addition, living and recreation quarters for the police officers. The smallest unit of accommodation is the rural police cottage at which no business is transacted and is residential only; it consists of a normal parlour type cottage. The next unit in size is a residence for a police officer in a rural area, at which business is transacted and it is marked with a notice indicating that it is a police building; the accommodation for this type comprises a dwelling as outlined above, with the addition of (a) a small room to serve as an office, and (b) a shelter for a bicycle, as the latter is a part of the normal equipment of a rural policeman.

The next type is a dwelling to which is attached a charge room and one or two cells. It is important that separate entrances are provided for the house and for the charge room and that these should be placed as far apart as convenient, but with the entrance to the charge room or business part in the more prominent position. If the dwelling-house is to be used for constables or sergeants, a parlour-type cottage accommodation is needed, but if the occupier is to be of higher rank, the number and area of rooms should be increased. If, however, the dwelling accommodation is to be used for single men it should comprise a day room, kitchen, separate or cubicle bedrooms for each man, together with adequate provisions for bath, lavatory and W.C. accommodation.

Plan Types—Figure 2 illustrates diagrammatically the essential layout factors for the type of police residence with a charge room and cells attached. All persons entering or leaving the business part of the building must pass by the person in charge, except as regards an entrance from the house directly into the charge room or lobby thereto. Cells must not open directly out of the charge room but should be approached from a corridor leading out of the charge room; this corridor should also give access to the W.C.s and wash basins for the use of prisoners. A small enclosed yard for exercising prisoners is needed and should also be approached from the same cell corridor. The exercising yard must be well enclosed and screened from view from the street, and entirely separate from any yard or garden attached to the house. The cells and approach corridors should be of single-story construction and in any event neither living nor bedrooms must be placed over them. If W.C.s cannot be used owing to lack of water and earth or chemical closets

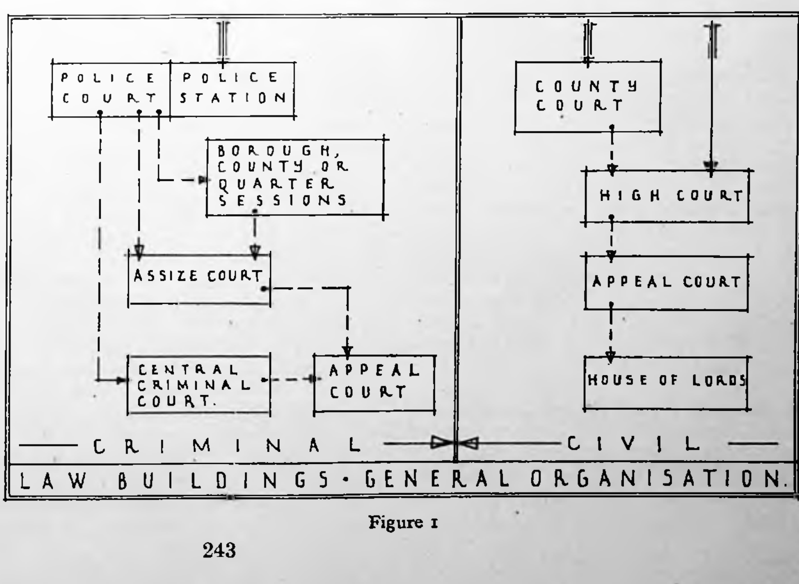


Figure 1

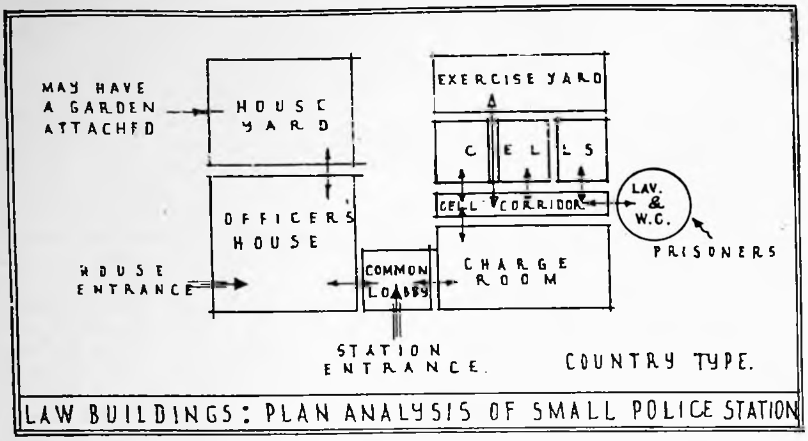


Figure 2

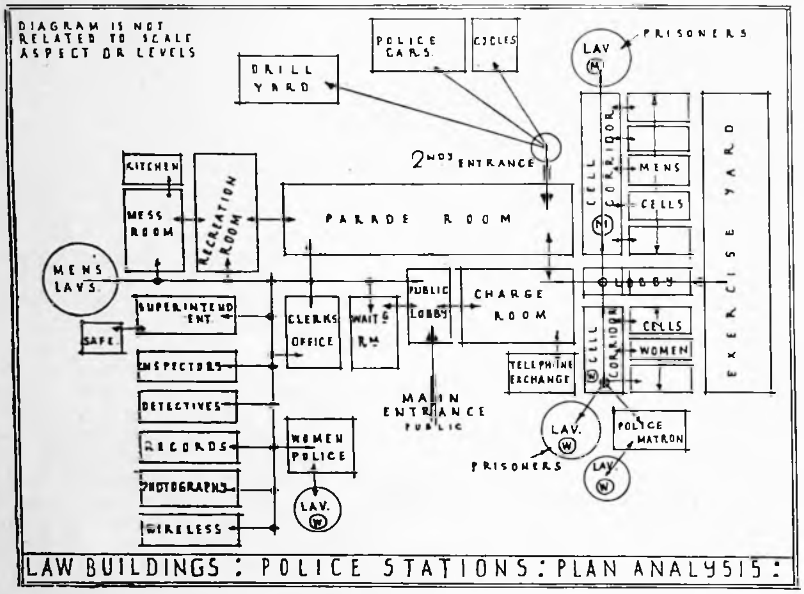


Figure 3

have to be installed, these should be placed in the exercise yard and must not be approached from the normal enclosed cell corridor. W.C.s are sometimes placed in cells, as will be discussed later in this series.

Figure 3 illustrates in diagram form the essential accommodation necessary for larger police stations in urban districts, which are increased or decreased in proportion to local needs either as a borough, county, main or branch station. Living accommodation for the various ranks of the police force may be provided in conjunction with, and additional to, the police station either on upper floors or in adjoining buildings, but the provision of such domestic accommodation has but little direct bearing on the planning of the station itself.

General Circulations—The circulations of a police station are divided into three main sections, firstly for the officers themselves, secondly for the prisoners, and thirdly, for the public. All circulations should pass through the same main entrance under the control of a policeman on duty, but it is often also essential to have another entrance placed in an inconspicuous position at the rear of the building from which policemen and prisoners can enter or leave without passing through the main entrance. The circulations should divide at the entrance lobby, the public and prisoners going to the charge room, which also serves as the general public office; a waiting room for public and such persons as witnesses or those inquiring after lost property should adjoin the main entrance lobby. The charge room should have direct access to the cell corridors or to a staircase leading thereto, for men and women prisoners. The cells for each sex must be separate, each section with separate W.C.s and lavatories and, when there are several cells for female prisoners, a room with sanitary accommodation adjoining for the police matron is required.

The cells should be planned to lead directly to an enclosed exercise yard, if such is provided. The entrance lobby or office corridor should also lead to the parade room, which is the main assembly room for the police and also serves as lecture, cloak, and general service room. Attached to the parade room should be the police recreation room, mess room, kitchen and sanitary accommodation for the uniform staff. A number of offices and workrooms are required to which the public may also need access, but only after first being received in the charge room; these rooms comprise offices for the superintendent, inspectors, detectives, clerks, rooms for photography, records, wireless, and rooms for women police with separate cloakroom and lavatory. A drill yard is required from which the garages and cycle sheds may be approached; consequently a roadway connection to the street is needed, which also serves the purpose of a rear approach to the whole station for police cars and vans for prisoners.

Charge Room, etc—The public entrance lobby of a polcie station does not need to be very large, and should act mainly as a vestibule or draught lobby. Sometimes a small waiting room is required adjoining the entrance lobby and/or charge room and it is desirable that such a room is supervised and controlled by the officer on duty in the charge room, or on the entrance doors. There should be direct and easy access for the public to the charge room, which usually serves also as a general public inquiry room; in some larger stations a separate inquiry office is provided and attached to it storage space for lost property is also occasionally planned. In all stations it is desirable to provide some suitable space for storage of lost property fitted with shelves or racks for more bulky parcels, umbrellas, etc., but articles of value, which are usually smaller, are generally kept in cupboards in the inquiry office or charge room, or a separate strong room is provided. Many schemes provide a separate entrance from the yard or a side roadway for police and prisoners to enter the charge room in order to avoid the necessity of using the more public access through the main entrance. The charge room itself varies in size according to the importance of the station, but the smallest area generally allowed is about 250 sq. ft., increasing in large stations to about 400 sq. ft., beyond which additional rooms are more general, rather than increasing the size of the charge room itself. It is essential that there should be direct access to the cell corridor or staircase thereto from the charge room by means of a different door from that used by the public entering the charge room from the public lobby.

Although in most stations some provision is made for accommodating prisoners in the charge room in a form of dock or enclosed seat, there are,

however, many stations where nothing, excepting perhaps a seat, is provided. The proceedings in connection with the committal of a prisoner to temporary detention generally do not take long and several officers are always present, thus making the possibility of the prisoner escaping small. The remainder of the equipment of a charge room, other than a dock, is the main counter, which divides the public from the police working space, desks for office work and storage cupboards and filing space. The counter is similar to a normal office inquiry counter about 3 ft 3 in high and 2 ft to 2 ft 6 in wide, usually with a flat top, but sometimes provided with one or two writing slopes and cupboards; a grille is not required on the counter front. The counter often extends the full width of the room between walls and a flap and wicket is then necessary for access to the public side, or for prisoners to pass through. The desks are usually single- or double-sided high desks with sloping tops with stools for ordinary clerical work; these desks often have kneehole and pedestal drawers. The public space between the wall and counter should not be less than 6 ft; it is general to have some clear wall space for notice boards in the public space. Figure 4 illustrates two typical types of charge rooms, type A being more suitable for larger stations and Type B for smaller stations. Type A has an enclosed seat at the end of the counter between the public space and the office proper, which is used as the dock when charges are being read to prisoners; the counter occupies the remainder of the width of the room and is returned under the window to serve as a writing space for use by the public. This writing space is separated from the police desk adjoining by a screen which prevents members of the public standing at the counter from reading documents on the police desk. The centre double-sided desk is on the lines outlined above. A sound-proof telephone box is fitted in one corner of the room, a necessary arrangement when the main telephone exchange room is separate and not communicating with the charge room. The door opposite the public space leads to the cell corridor; it is so placed that prisoners do not have to be taken between or near desks, which might impede the passage of two or three persons abreast. Type B is smaller than Type A, but is similar in most respects, particularly as regards the circulation for prisoners, excepting that there is not a dock, but merely a seat in the charge room. The main difference is that the telephone room, in which is accommodated the main switchboard, is approached from the charge room and may be used by the officer on duty when making calls, or in smaller or more rural districts the switchboard may be operated by an officer on duty in the charge room. It must however be remembered that the telephone is becoming a very important factor in police work and the switchboard will generally need constant attention. Adequate window area is essential to ensure good lighting and it is preferable if placed on the left-hand side or in front of the main counter and writing desks. The charge room in small rural stations, which are often attached to the residence of a police officer, requires a separate entrance other than that to the residence, but it is usual to have an internal connecting door from the house to the charge room, which should also be separate from the door to the cell corridor. The layout of the room is, in general, as outlined above, either with or without a dock.

Offices—Offices are required for various officials which are normal office rooms and of sizes varying according to the work to be done in them. A fairly large office is required for the chief official in charge of the station, and this becomes even larger for the chief constable of a county or borough controlling a large number of men; this room is needed for conferences and therefore requires a table to seat, say, a minimum of ten persons, in addition to a private desk. A room is needed for inspectors, which is furnished with desks, with some filing cabinets and cupboards in addition. Detectives require a separate room and often a small additional room is provided for the chief detective officer attached to the station, who is in charge of the detective staff, particularly in more important stations. These rooms have to provide for considerable filing space and also general bookshelves and office furniture; this filing is for current matters and is quite apart from the general and main filing in the record room which is at the chief offices of each administrative district. Record rooms, when provided, have to accommodate filing systems of various types, such as for letters and for similar documents, finger prints, photographs, etc. Tables for use in connection with the record room are needed either in the room itself, or in an adjoining room, where officials may do all the work in recording or consulting records.

The more important stations require special rooms for photography, with a dark room attached, and a room for wireless apparatus; the sizes of the rooms are entirely dependent on the district to be served, but from the point of view of planning are merely very well lighted and ventilated rooms with certain special considerations as the equipment of the dark room and a light cut-off lobby. A general office is required in all larger stations, and in chief stations provision is needed for many clerks; also a separate room for typists is then necessary adjoining the general office.

Other office accommodation which may be needed in conjunction with the larger type of stations, is a room with lavatory adjoining for women police. A hackney carriage office is often required; the public require easy access to this office, which should be equipped with a counter, desks, and have its own filing system, if necessary in a separate room.

A map room is often required and is generally planned to be near the senior officer's rooms.

Parade Room—This is a large room which is used for a variety of purposes, such as parades for patrols, lectures, first-aid classes, etc. It also serves as a locker room, and is equipped either with lockers or pegs and seats with boot-racks placed round the walls; it is important that there is direct and easy access from this room to the main entrance and it is usual to provide more or less direct access to the drill yard. All but the smallest stations require a parade room, the size of which is dependent on the strength of the force attached to the station.

Recreation Rooms—These are to some extent dependent on whether some of the force live at or near the station. When there are resident bachelors, recreation rooms have to be larger and more numerous, but in all except very small branch stations at

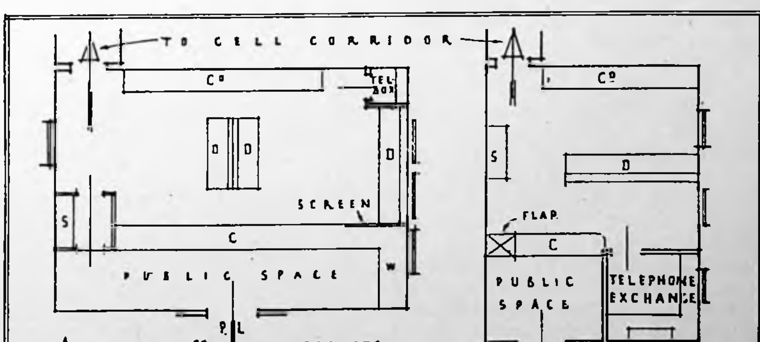


Figure 4

least one recreation room is needed, sufficiently large to house one or more billiard tables and leave ample space in addition for other purposes.

Canteen—A small canteen and kitchen is needed in most stations in which the men can get a meal quickly in off-duty times or breaks during duty; this canteen is apart from any dining-rooms needed for residents.

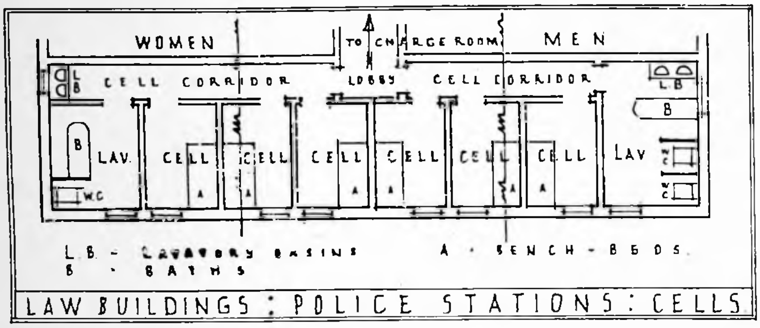


Figure 5

The canteen or mess room is usually fitted up with a service counter with apparatus sufficient to heat up men's own meals or prepare light meals and refreshments such as tea and coffee; has and/or electric power points, a sink with a draining board and shelves and cupboards for various types of stores are required.

Cells—These should be divided into two groups, one for male and the other for female prisoners. The cells may be placed on one or both sides of a corridor not less than 4 ft, and better 4 ft 6 in wide, increasing to 5 ft if there are many cells approached from it; if the cell doors open outward, the minimum width should be 5 ft. These cell corridors must be adequately lighted artificially, and when possible should have windows to admit daylight, and should have smooth walls free from projections. When it is impossible to provide windows for ventilation of the corridors it is essential to install mechanical means of ventilation, or, as is quite usual, to allow for the formation of extract flues by which the air is drawn to the top of the building; the air is introduced into the corridors through the cells, as will be discussed later; thus a complete air circulation is obtained.

The two groups of cells should have a common lobby approached by a corridor and if necessary a staircase from the charge room, with cut-off doors giving access to each group. The warder's and matron's rooms can be placed adjoining this lobby, or, if preferred, they may lead off the corridors of the male and female sections, but should be on the cell sides of the cut-off doors. (See Figure 5.)

The cells themselves are of two main types, the one having a W.C. in each cell and the other without W.C.s in the cells themselves, but collected in a group in one part of the cell corridor. The two types are sometimes used together in the same plan. Cells without W.C.s should have a cubic capacity of at least 600 cu. ft., which is generally provided by having a floor area of about 6 ft 9 in by 10 ft, with a height from floor to ceiling of about 9 ft, which gives a floor to floor height of about 10 ft. Cells with W.C.s require a greater area and should have a cubic capacity of at least 800 cu. ft. There seems a tendency to provide greater numbers of cells with W.C.s for male prisoners in more recent police buildings. It is general to place the W.C. pan in the corner of the cell in order to facilitate the enclosing of the cistern and plumbing, as there must be no projections whatever and only the smallest possible sliding handle—and that at a low level—for operating the flushing cistern; Figure 6 B shows a satisfactory cell layout with special reference to the enclosing of the W.C. The enclosing walls of cells should be at least 14 in brickwork and division walls 9 in brickwork; the interiors of cells must be finished with glazed bricks or other smooth hard materials which may be cleaned easily, and floors should be similarly treated. The structural floors and ceilings must also be specially strong.

Every cell must have a separate window which is generally fixed. Panes must not exceed 5 in by 8 in.

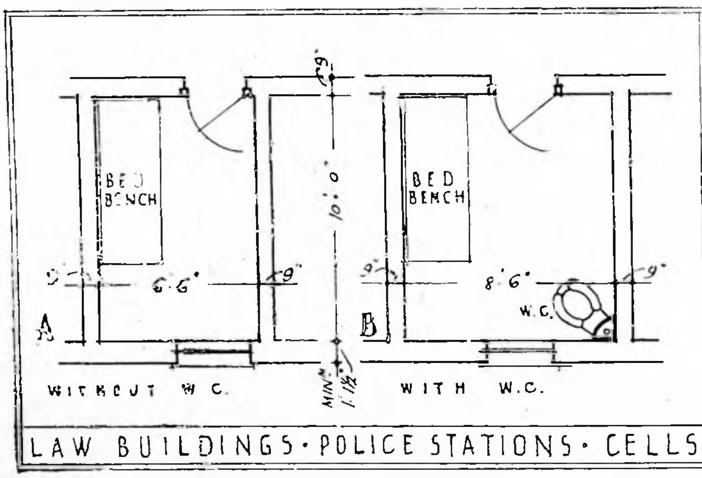


Figure 6

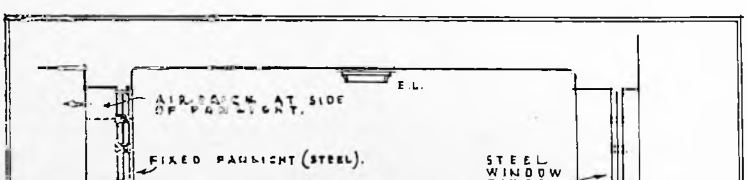


Figure 7

in the clear, and the total area should give at least 1 sq. ft. of glass to every 80 cu. ft. of space in the cell. Windows are usually of iron or steel, but if of cast iron, guard bars should be fixed outside. Windows of cells, and consequently the cell block, must not be placed where they can be overlooked.

Doors and frames to cells must be very securely fixed, and are frequently covered with metal on the inner face turned round the edges so that it cannot be removed. A glazed inspection or observation panel is essential, and this should be fitted with a cover on the corridor side only. A food trap is often incorporated in the door. Doors are sometimes hung to open inwards and sometimes outwards, each method having certain advantages over the other in regard to handling of troublesome prisoners, but it is important that doors, if opening outwards, are fitted with bolts in addition to locks.

Every cell should have a fixed fitting to serve as seat and bed. This is generally a wooden bench about 30 in wide, 7 ft long and 16 in to 18 in above the floor, 2 in or 3 in away from the wall and open below to facilitate cleaning; these bench-beds must be very solid and securely fixed.

Artificial lighting is usually provided by bulkhead type electric fittings of specially heavy construction, without wire or similar guards, and with all connections to conduits buried. Switches should be outside the cells.

A bell from each cell to the warder's or matron's room, or to the room in which the officers may be on duty, such as the charge-room in smaller stations, is now usual.

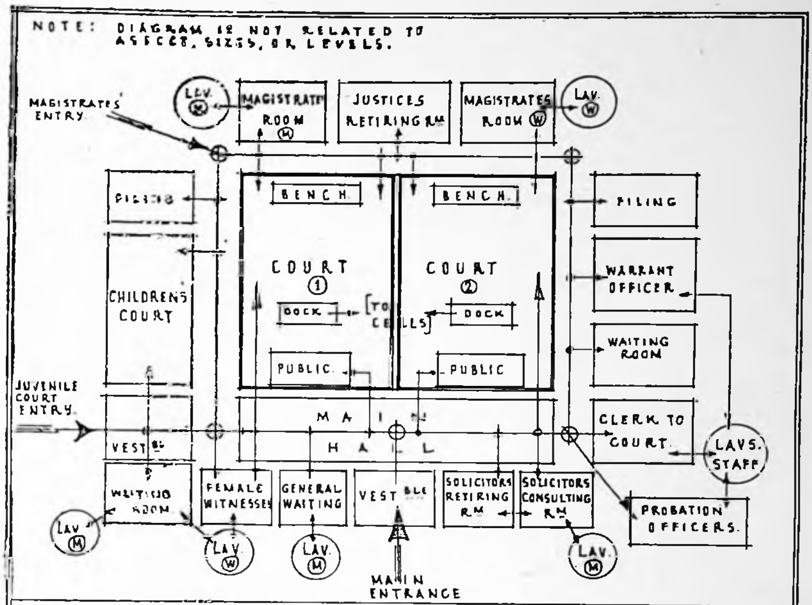
The ventilation of cells is of the utmost importance; this may be provided satisfactorily by omitting the glass in one or more panes of the window and fanlight and by substituting wire mesh; windows treated thus should be fixed high up near the ceiling and opposite the door on one side of the cell, as shown in Figures 6 and 7. Another and better method is to place an air brick below the window and, better still, if the thickness of the window wall permits, to admit the air by means of an air brick at a low level and form a duct up to an outlet in the sill of the window. If the fanlight over the door be totally glazed, there should be another air brick from the cell to the corridor, which should be placed at a high level. The air is extracted from the cells into the corridor and from the corridor either by means of flues, mechanical ventilation, or by windows, as described previously.

Prisoners' Sanitary Accommodation—As already stated, W.C.s are frequently provided in the cells themselves, and must be in such a position that they can be supervised from the observation panel in the door, except that sometimes in cells for female prisoners, dwarf screens are installed.

When W.C.s are not provided in the cells, separate W.C.s at the rate of one for every ten cells and, if possible, a minimum of two W.C.s, should be provided off the cell corridor in a group to facilitate plumbing, as shown in Figure 5. Facilities for washing must also be provided in the form of lavatory basins and sometimes with the addition of a bath, although the latter does not appear a very general provision. Figure 5 shows two typical positions for lavatory basins; on the side (marked "women") the basins are placed in the open end of the cell corridor, and on the other (marked "men") the basins are enclosed in a room with a bath; either layout may be adopted in either section; when baths are installed only one end should be against a wall, with ample circulation space round the fitting. Basins should be in the same ratio as W.C.s.

Exercise Yard—One exercise yard usually serves for both male and female prisoners; the yard should open off the cell corridor and should not be overlooked by surrounding windows from rooms other than cells or warders' rooms. The yard must be either entirely surrounded by the building or have a high wall to enclose it.

Officers' Rooms—Rooms for the use of warders or matrons, when required, should be small, having an area of 100 to 120 sq. ft., and should be attached to the appropriate male and female groups. A police matron's room should have separate lavatory accommodation attached, or near, to it. Telephonic communication should be provided between the warder's and matron's rooms and the charge room if there is any considerable distance between these units.



LAW BUILDINGS : POLICE COURTS : TYPICAL ANALYSIS PLAN·

Figure 8

COURT BUILDINGS

Under this general heading it is proposed first to consider the planning of normal police court buildings which may or may not form part of a group of municipal buildings or be planned in connection with police stations. Separate buildings are often provided in many areas and usually have at least two court rooms with a number of other rooms for administrative and consultative purposes. As previously stated, justices' courts may also be used for other purposes than police courts, in which case slightly different arrangements have to be made, such as provision for juries. (A typical court of this kind will be discussed later.)

Police Courts—Figure 8 illustrates the typical circulations of an independent police court or petty sessional court building. If this is attached to a police station very similar accommodation is necessary, excepting that cell accommodation for prisoners need not be duplicated, although care must be taken to plan the cell unit in a position that may provide easy access to the courts.

At the main entrance there should be a good-sized vestibule with cut-off draught doors, as people may have to wait for long periods in the main hall. The main hall or crush space must be large enough to provide adequate circulation for many people passing between all rooms to which the public may require access. Off this main hall should be placed the courts themselves, waiting-rooms for the public and witnesses, the offices of the chief court officials and, if possible, the solicitors' room and one or more solicitors' consulting rooms.

The waiting-rooms do not have to be

very large and areas of about 300 sq. ft. are sufficient for most court buildings ; a separate waiting-room is sometimes provided for persons (other than prisoners and witnesses) wishing to see the magistrates. Lavatory accommodation for both sexes must be provided for those using the general waiting-rooms, with an allowance of at least two W.C.s and two lavatory basins for each sex, together with urinal space for men.

Female witnesses usually have a special waiting-room with lavatory accommodation adjacent, and for normal purposes a room about 250 sq. ft. is adequate. The courts may vary somewhat in floor area ; many examples provide only about 800 sq. ft., but 1,000 to 1,200 sq. ft. provide areas which can be much more easily handled in detailed planning ; care should be taken not to make the court rooms too narrow as the circulations of the main part of the court in which the solicitors, witnesses, etc., have to be seated become too cramped ; in addition, a narrow court allows insufficient length for the Bench. The number of magistrates varies considerably from session to session and as many as ten or even more may be present at any one time. A good minimum width for a police court is about 25 ft. The details of the arrangement and layout of the court will be discussed fully at a later stage in this series.

The entrances to the court rooms are of three main types ; firstly, the public and witnesses from the main hall and waiting-rooms ; secondly, the prisoners from the cells, generally directly into the dock up a staircase from the cell corridor in the basement and, thirdly, the magistrates, who need direct access to the Bench from their suite of rooms. A separate court is often provided for juvenile cases and this court is often used for other purposes such as matrimonial cases ; a juvenile court should be cut off from any other courts and should have a separate entrance from the street and separate waiting-rooms which are sometimes divided, so that one is used by boys and one by girls, and in any case, separate lavatories attached to the waiting-rooms are needed for boys and girls ; these waiting-rooms do not need to be more than 120ft sq. ft. if divided, or 200 sq. ft. if both sexes use the same room. A children's court may be much smaller than a normal court, and an area of about 450 to 500 sq. ft. is generally sufficient as only a few persons are present when cases of this type are heard, and special public accommodation is generally not provided.

The accommodation needed for the magistrates comprises a suite of rooms approached from a hall or wide corridor, generally at the ends of the courts opposite to the main public hall. The rooms necessary are, firstly, a large room which is in the nature of a board or common room and should have an area of some 500 to 700 sq. ft. Secondly, two retiring rooms, one for male and the other for female magistrates, each of which should have lavatories adjoining or directly approached from them. In many schemes only the last two rooms referred to are provided and the common room is omitted, so that conferences take place in the male magistrates' retiring room, which should then be large enough to seat at least ten persons round a table. The retiring rooms, if not to be used for conference purposes, need only be about 120 to 200 sq. ft. in area and as the number of women magistrates is likely to be less, their room may consequently be smaller. A separate entrance to the building, leading directly on to the magistrates' corridor, is essential for the magistrates.

Offices for the court should provide general office space for several clerks, and a private office for the Clerk to the Court, and also for an Assistant Clerk if there is one. The public need access to the general clerical office, which should have a counter. A separate entrance is sometimes provided to the offices as these are in constant use and the main entrance serving the courts, etc., may then only be opened on those days and at such times as is necessary. Lavatory accommodation for both sexes is needed for the staff of the Clerk of the Court.

The solicitors' room generally has an area about 200 sq. ft. or more, depending on the number of courts in the building. Near it should be a small room which can be used for consultations between solicitors or between solicitors and clients. Separate lavatory accommodation should be provided for the solicitors near their room or approached directly from it.

One or two rooms for probation officers should be provided ; these may be about 120 to 150 sq. ft., and may be on an upper floor.

Other rooms which may be placed on upper floors are, for part of the clerical staff, filing spaces, and even the solicitors' rooms, although the latter is not very desirable.

The prisoners should have a separate entrance leading directly to the cell corridor, usually in the basement. The number of cells varies somewhat, but the layout is as previously described for police stations, separate groups of cells being provided for male and female prisoners together with a matron's and a warders' room.

It is general to provide for a resident caretaker by placing a flat on an upper floor.

The only rooms which call for special information in a police court building, other than the accommodation for prisoners which has already been detailed under the heading of cells in police stations, are the court rooms. The area generally allowed, as already stated, varies from 800 to 1,200 sq. ft., and the minimum desirable width is 25 ft. The usual plan is a rectangle with the bench or magistrates' seating at one end across the shorter dimension of the room. The floor level upon which the bench stands is usually raised about 3 ft, or slightly more, above the well level of the court in large courts and about 2 ft in small courts. This platform should be wide enough to accommodate two rows of chairs in addition to the fixed table, and should therefore be not less than 12 ft from the back wall of the court to the front of the level, but frequently provision is made for one row of chairs only when the width of the platform may be reduced to 7 ft 6 in. The Clerk of the Court is usually seated immediately in front of the Chairman of the Magistrates, in the centre of the bench and on a platform raised about 12 in above the floor of the Court, although in smaller Courts, a single 6 in step is often used. Several chairs are often placed on each side of the Clerk of the Court, and these share the same table or desk, but are placed one step lower, with the table height similarly reduced. The Clerk requires a large table and therefore at least 5 ft 6 in should be allowed, to give 2 ft 6 in for chairs and a 3 ft wide table. In front of and facing the Clerk of the Court on the well level of the court, should be placed a number of seats with writing space, for the use of solicitors. These seats are generally built-in sometimes of tip-up type, and should be spaced at least 3 ft 3 in back to back and preferably rather more ; tip-up seats are essential if minimum spacing is allowed and it is important to allow sufficient space between the edge of the writing surface and the seat when tipped up for a person to stand in comfort to address the Court. It is desirable that the writing surface is 15 in wide, to hold foolscap papers and books, although this has seldom been adequately considered in court planning.

Two witness boxes are usually provided, one on each side of the Court and these are generally raised twelve or eighteen inches above the floor of the court. Witness boxes require about 3 ft in width and about 3 ft 6 in. in depth ; they are usually enclosed on three sides to a height of about 3 ft 6 in above the floor ; a small flap seat is usually provided, hinged noiselessly to the back of the witness stand.

The dock for the prisoners is usually placed in the centre of the court, behind the seating for the solicitors ; the staircase from the cell corridor should deliver inside the dock enclosure, but it should be so placed that direct access into the dock is also possible, as shown below. In some police courts, however, the staircase from the cells is placed centrally between two courts and prisoners enter the room at one side near the dock at normal floor level, and walk across the room from the staircase to the dock, which is not

a very satisfactory arrangement. The staircase from the cells into the dock should be at least 2 ft 6 in wide; greater width is not specially necessary. The floor of the dock should be raised two steps above the general well level of the court, which brings it to the same level as the witness stands.

The dock is usually about 10 ft. long, although this is sometimes reduced considerably and in many courts they are only about 7 ft long; the width is generally about 3 ft wide, which allows sufficient space for a small writing flap and also hinged wooden seats. The dock is usually enclosed on all sides, to a height about 3 ft 6 in above the floor of the dock, with part of the enclosure hung as a wicket for access to and from the court.

Seating is usually provided on each side of the court, on one side for witnesses waiting to be called and for press on the other; this seating is often placed on the same floor level as the dock and witness stand and arranged so that the seats face across the well of the court; this seating is formed of fixed benches, with a fixed front to which a writing surface is sometimes attached; the number of these seats varies considerably, but there should be access at both ends and preferably not more than six seats in a row, without dividing gangways.

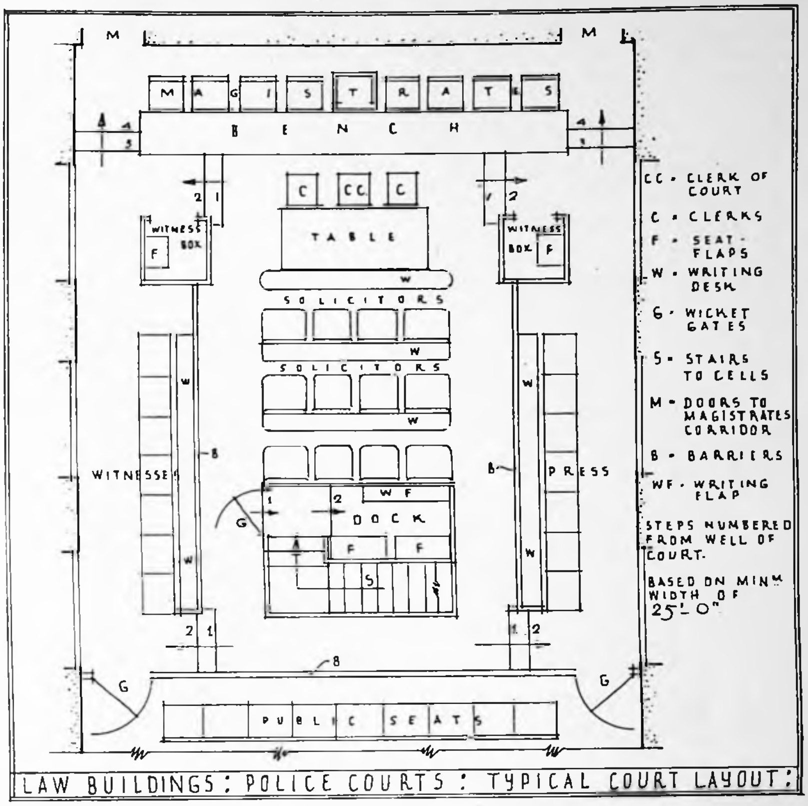


Figure 9

The public are usually placed at the opposite end of the court, and facing the magistrates' bench. Rows of fixed seats placed about 2 ft 6 in apart, back to back, and allowing about 1 ft 8 in run per person; these seats are usually raised in tiers to permit of a clear view of the court. In many plans the floor level of the lowest tier is often raised one or two steps above the general well level of the court, and this public portion of the room should be separated by a permanent barrier from the rest of the court, while in some schemes the public are placed in a gallery leaving the ground floor space for seating of witnesses, etc.

It is essential that courts are placed in a quiet position in the plan. If, by any chance, it is necessary to place a court with one of its walls as an external wall facing a street, windows should be avoided if street noises are considerable. As previously discussed when considering the general layout of the plan, courts are usually placed so that some of the lesser rooms are placed round the outside, thus isolating the courts and permitting windows to obtain light from wells rather than from street frontages. If windows are used to light courts, it is essential that they are placed on side walls and not facing or behind the magistrates' bench, and it is better if clerestory lighting is used rather than windows at lower levels, as this form of lighting is probably the most satisfactory. Side windows at low levels are not good, as they cause witnesses to be in silhouette when seen from the bench. Many courts are top-lighted only, or top-light is used in conjunction with some side windows or clerestory lights, and have proved quite satisfactory. Adequate ventilation is essential; if there is a doubt as to obtaining this by natural means, a mechanical ventilation system should be installed; as is also essential if there are windows facing into streets which, if opened, might on occasions allow too much noise to enter.

For reasons of good acoustics, which are of the utmost importance, courts should not be more than 25 ft in height, and, in fact, are often very much lower and even oppressive by being much too low; 15 ft should be the minimum height, in view of the area of the room. Ceilings should be flat or splayed at the outside walls only for acoustic reasons, and deep beams should be avoided transversing the ceiling parallel to the bench. The doors should be reduced to a minimum in number for convenient access to the court, and to avoid duplications of control. A door is required for the magistrates behind the bench, a door or doors for the public, which are sometimes used for general access to the court, but in addition another door or doors are sometimes planned to give access to the court apart from the public entrances.

In many districts, police courts are also used as county courts, and it is then necessary to provide for a jury. The jury box has to provide twelve seats, which are usually in two rows, and in order that each juryman has a clear view of witnesses and the dock, the floor level of the front row of seats is generally two steps above the level of the well of the court (same level as floors of dock and witness stands), and the back row raised an additional one or two steps. The seats are usually in an enclosure which needs at least a length of 12 ft, with space for any steps that may be required in addition, and an overall width of at least 6 ft; this latter dimension is only possible if tip-up seats are used and if the writing desk is kept to a width of about 9 in, which is rather inadequate.

Juvenile Courts—Special courts set aside expressly for juvenile cases are being more frequently built in recent years. These courts are in the nature of ordinary rooms about 500 sq. ft. in area, and fixed furniture is usually avoided and replaced by tables and chairs in order to achieve a less formal character. Figure 10 illustrates a typical layout for a juvenile court, and it should be noticed that the magistrates sit at one end of the room opposite the main door to the room, with the clerk to the court at a table adjoining the magistrates' table; on each side of the room are placed two long tables for witnesses, solicitors, parents and officials. The accused person usually stands for interview in front of the magistrates' table. A

table near the door is usually provided for a police officer. Additional seating may be provided behind the two side tables for use when necessary. A second entrance for use of the magistrates and placed behind their table, is needed ; this should give easy access to the magistrates' rooms.

Sessions Courts—Borough, County or Quarter Sessions courts are similar to police courts, but with a jury box, or to a small criminal assize court, as detailed later in this section.

Assize Courts—Special buildings are planned for Assize Courts in various centres throughout the country to which the High Court Judges go on circuit several times per annum. Police Courts are not generally planned in Assize Court buildings. It is general to provide at least two courts and sometimes three, although in a few towns one court only is provided. Although the courts are planned alike it is general to hear civil cases in one of the normal two courts and to hear criminal cases in the other ; the reason for similar planning is that when cases of one type are concluded the judge may continue with the other type if the number of cases necessitates this procedure. The main difference between civil and criminal cases is that a dock is not needed for the former.

Figure 11 illustrates the main analysis of an Assize Court building having two courts. A very large entrance hall called the Assize hall is most important as many people have to wait about in court buildings. From the Assize hall should open rooms for male and female witnesses and for the police officers, together with the necessary lavatories. Leading also from the Assize hall should be corridors from which should open all the rooms for officials and lawyers, but these corridors should be so arranged that the public do not have uncontrolled access to these parts of the building, although moderately easy access is required to the rooms for the legal profession. The various rooms to be provided are : for officials, the sheriff, under-sheriff, clerk of Assize, registrar, taxing master ; for the legal profession, robing rooms for barristers and solicitors, consultation rooms, a law library and often

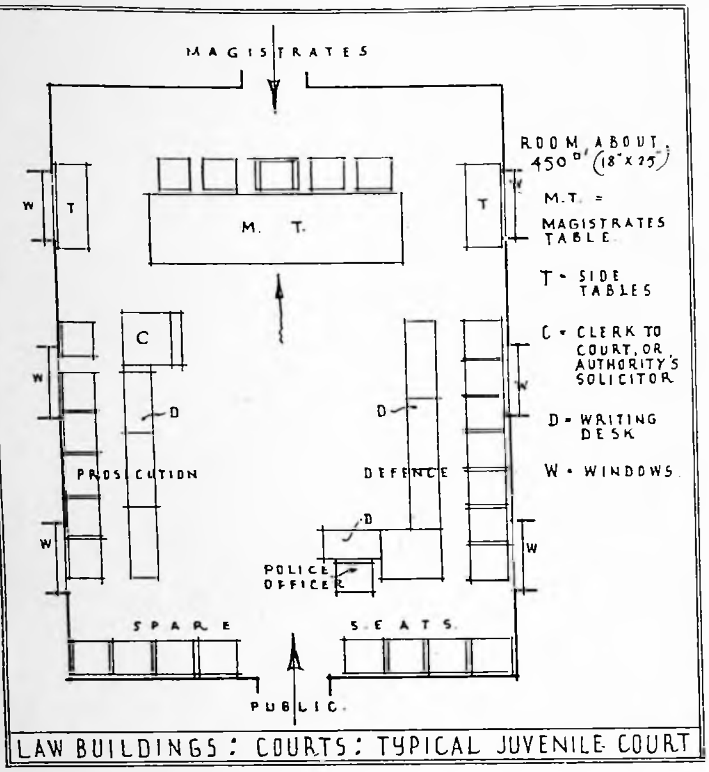


Figure 10

Matrimonial Courts—Special courts for this type of case have been set up in some districts and when a juvenile court is available this is frequently used for both purposes. The arrangement needed for a court of this type is similar to that shown in Figure 10 for juvenile courts, fixed furniture not being necessary. An important factor when planning rooms for courts of either of these types of cases is that they should have adequate daylight from such sources that the light is on and not behind the accused persons when standing in front of the magistrates' table. Adequate and properly placed artificial light is also important when the rooms are used for matrimonial cases in districts which have special evening sittings of the court, as is the practice in some districts.

Coroners' Courts—Special courts for this purpose are sometimes required ; they need not be large rooms as the number of persons attending is usually small. A dock is not necessary, but provision must be made for a jury. Coroners frequently use police courts for their hearings when special courts for this purpose are not available.

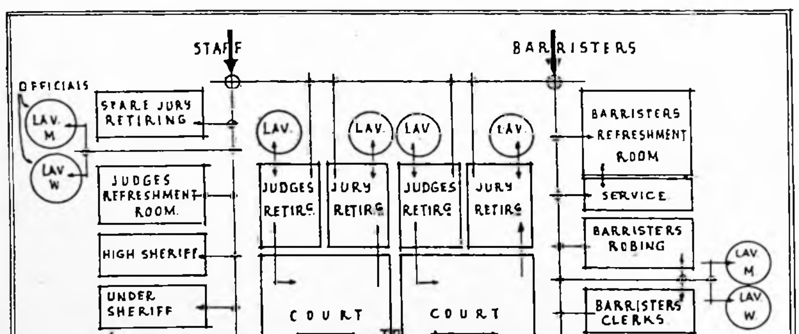


Figure 11

refreshment rooms ; the robing rooms and lavatories must provide accommodation for both sexes. The robing rooms need to be of considerable size as there are usually many persons to use them. The law library should be a large room which may also be used at times for court purposes, such as assessment of damages, or even as a third court. The consultation rooms, of which there should be several, may be small rooms, but should have seating accommodation for ten or twelve persons and they should be placed near the barristers' robing rooms if possible. Immediately adjoining the courts, on the opposite side to the Assize hall, should be a judges' retiring room and a jury retiring room for each court. Direct access from the courts to these rooms is essential ; lavatory accommodation must be attached to each room. A separate entrance is generally provided near the judges' and jury rooms which may be used if required, although it is usual for everybody to use the main entrance to the building at all times. The public have to be accommodated in each court in special public galleries, access to which should be from the Assize hall or near the main entrance to this hall. Care should be taken to cut off any noise of the Assize hall from the courts and from the rooms required for officials and the legal profession. A spare jury retiring room (making three jury rooms in all) is sometimes provided, as juries may consider verdicts for long periods and other cases are heard during this time and may need the two normal jury rooms ; this room is also used for such court purposes as outlined above for the law library in order to free the latter room for its proper purpose. The prisoners for criminal cases are brought to the building in prison vans, which must have a proper approach to the cells, preferably in an enclosed yard at the lower (cell) level ; the cells are generally placed under the courts themselves and the adjoining rooms in order to provide direct access by staircases directly into the docks in each court. Luncheon rooms are usually provided for the legal profession and also in some instances for the judges, although the latter more often return to their lodgings.

Assize Courts are generally about 2,000 sq. ft. in area and great care should be taken to ensure good acoustics when designing both the plan shape and the section. Top-light with the addition of clerestory windows is the most satisfactory method of lighting the courts adequately and at the same time avoiding excessive shadows on the faces of those who may occupy the main speaking positions such as the witness stand, jury box and the seats for lawyers. Double doors are essential between the courts and any surrounding rooms other than the judge's room and the jury room. It is usual to have the

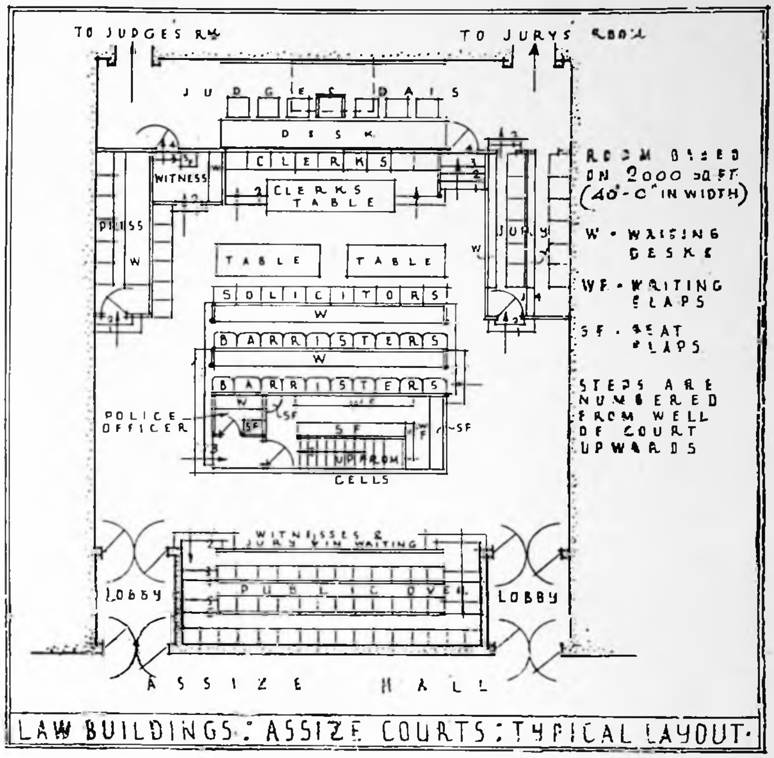


Figure 12

rooms approximately two normal (office) stories in height in order to plan the public space in a gallery so that it is completely separated from the remainder of the room. The public gallery should have its approaches quite apart from all means of access to the court, and these approaches should, if possible, be made from the ground floor or the court floor level near the main entrance to the building, not necessarily and even not preferably leading out of the Assize hall itself. The public access may therefore be well planned leading off the entrance vestibule or even from a separate external minor entrance. Figure 12 illustrates a typical court layout ; courts are rather square-shaped rectangles with an annex for witnesses and jury-in-waiting at the end opposite the judge's dais. This annex is usually planned between two entrance lobbies with the public gallery on an upper stage in a similar position but with possibly some projection forward over the well of the court, or perhaps with greater depth arranged over a portion of the Assize hall, if the latter is not carried up too high. The public gallery usually provides seating for about fifty persons ; this seating is generally in the form of long benches or seats and is not as a rule made too comfortable, in order to discourage persons not having special interest in the cases from staying for very lengthy periods.

The judge's dais should be the full width of the room and should be raised well above the level of the well of the court. It is advisable that this dais is from 2 ft 6 in to 4 ft above the well level, as it is essential that the judge's seat should be on a floor level slightly higher (say 12 in) than the level of the witness-box floor and the floor upon which is placed the seat of the Clerk of the Assize and other officials who are seated immediately in front of the judge. The judge's desk should be slightly raised above the general level of the remainder of the dais desk, at which are seated a number of officials such as the Judge's Clerk, the Marshall, the Sheriff and the Judge's Chaplain. The judge's entrance to the court must be by a door on the dais behind the bench and, although in many schemes this door is placed so that the judge's chair screens the entrance, it is probably better to place it slightly to one side and balance this door about the centre line with the door required for direct access of the jury retiring room ; also it is probable that a better decorative and more dignified effect together with a better acoustical treatment is obtainable if a wall space is arranged directly behind the judge's seat. A canopy acting as a sounding board is often designed over the judge's seat.

The desk and seats for the Clerk of the Assize (at least two seats are generally required) are usually designed to form part of the judge's dais and bench. Both the judge and the Clerk of the Assize require very ample table space in front of them on which documents may be spread out. The Clerk of the Assize must be so

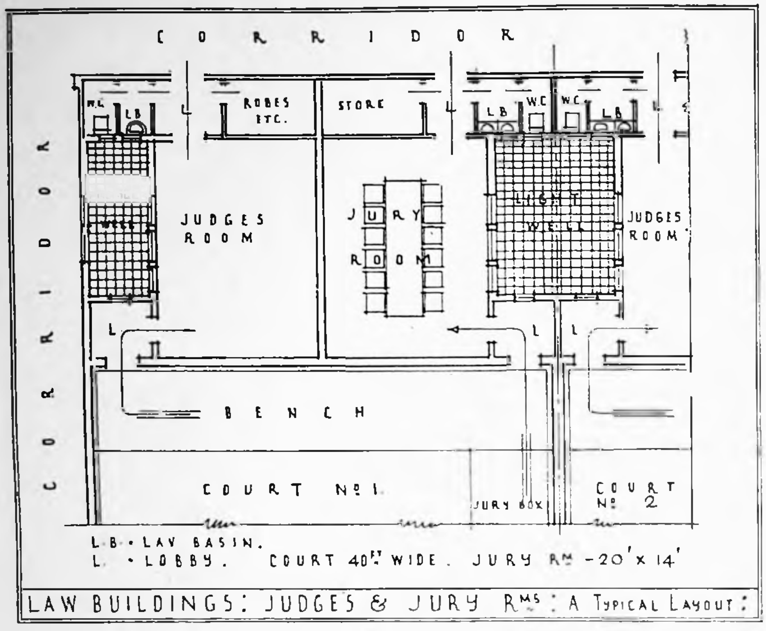


Figure 13

placed that he may converse easily with the judge by standing up, but he must not interrupt the judge's view of persons in the court when he is seated. The dais for the Clerk of the Assize is usually placed from one to two feet above the level of the well of the court.

The dock is usually arranged towards the back of the court; it must be large enough to seat a number of prisoners (up to, say, 12), and an enclosure about 12 to 15 ft in length and 6 or 7 ft in width is desirable. The dock should be enclosed with strong barriers about 3 ft 3 in (or rather more) in height above the floor level of the dock. The floor of the dock should be about the same level above the well of the court as the judge's dais. Direct access to the cells by means of a staircase about 2 ft 6 in wide and without winding steps placed inside the enclosure is essential. A door must be provided at the bottom of the steps to cut off noise from the cell corridors below. A wicket gate access is also required from the court into the dock enclosure.

The space between the desk of the Clerk of the Assize and the dock is used by the solicitors and barristers. At the front are usually placed one or more large tables for documents and exhibits required in connection with cases; behind these tables are the seats for solicitors, and behind these the barristers are placed in two or more rows. These seats for the barristers should be of a tip-up type and should have adequate desk space (at least 15 in wide) in front of each seat. These rows of seats should be stepped-up to ensure that everyone has a clear view of the judge and witness-box; this seating should be spaced at least 4 ft from back to back of rows, and at least 2 ft centre to centre of seats.

Witness-boxes may be placed in either of two positions, although the main advantages seem to point towards one of the positions as being undoubtedly the better. This is, it is suggested, as shown in Figure 12, which places the box on the opposite side of the Clerk's dais to that occupied by the jury, so that the jury may see the faces of witnesses without difficulty; the alternative position is to place the witness between the judge and the jury, which seems bad from all points of view. The witness-box is usually about 5 ft by 3 ft and its floor should be raised nearly to the height of the judge's dais, which necessitates the floor level being about 2 ft above the level of the well of the court; the witness-box is partially enclosed at about 3 ft 3 in above the floor, particularly across the front, which should be fitted in the form of a desk. It is desirable that there should be access from the judge's dais to the witness-box as well as the normal access by steps from the well of the court; a flap seat should be provided for the use of witnesses.

The jury box should be placed on one side of the court with the floor level of the front row of seats either at or just below the level of the judge's dais; the back row of seats should be raised one or two extra steps to ensure of clear vision of the dock, witness-box and the seating occupied by the barristers. The jury require twelve seats, which are generally in two rows occupying an enclosure about 15 ft by 6 ft 6 in or 7 ft, inclusive of access steps. Direct access across the judge's dais to the jury room is essential. Comfortable tip-up seats are needed, together with a writing surface in front of each person. Access from the well of the court is also needed, as those waiting to be called to serve on juries are seated at the back of the court behind the dock, as already mentioned above. The jury box is usually placed on the judge's left-hand side, but owing to the placing of two courts side by side, as is usual in court buildings, it is often necessary, for reasons of access and the placing of judge's and jury rooms, to exchange the positions of the jury box, witness-box and press box.

It is usual to provide seating for the press in an enclosure, somewhat similar to that used as jury box, on the opposite side of the court to the jury. Such an enclosure provides for about six pressmen, which is generally found to be sufficient. The fitting-up of the enclosure is also similar to the jury box, tip-up seats and a writing surface being the only requirements.

Judge's Room—This room should be directly attached to the court room with an approach through a small cut-off lobby. In view of this proximity to the court room and the necessity of providing circulation on the side opposite to the court, these rooms are generally given an internal position; such a position has the advantage of ensuring quietness and cutting the rooms off from all possibility of being planned with windows overlooked by public or semi-public streets or gardens. The planning of the judges' rooms in internal positions presents many difficulties of circulation, lighting and ventilation; top-light and overhead ventilation alone are undesirable in rooms of this type which are finished in the manner of a private office or a library of a good quality; it is therefore better if suitable areas or light-wells can be planned to give some, if not entirely, adequate side-light and proper ventilation for the lavatory and W.C. accommodation which must be planned adjacent to the room. The size required for the judge's room is at least 200 super feet but, since this room often has to correspond on the plan with the jury room it is very frequently made somewhat larger in area in order to balance the minimum area needed for a jury room. The judge's room should also be cut off by means of a lobby from the main circulation corridor; from this lobby should lead the door to the judge's lavatory and W.C. Figure 13 illustrates fully a good typical lay-out of a judge's room, the approach lobbies to the corridor and court room and the lavatory and W.C. The lighting area is planned easily in conjunction with the planning of the lobby between the judge's room and the court room, and, since it lights part of the main circulation corridor around the court room in addition to the judge's room and W.C., this area is not uneconomical and greatly assists the ventilation and pleasantness of both the corridor and the judge's room, allowing daylight into the

corridor and avoiding total top-lighting for the Judge's room.

Jury Room—The jury room, like the judge's room, must have direct access from the court room on the side of the jury box and also from the main circulation corridor on the opposite side. A lavatory and W.C. attached to this room and approached from it without entering any general circulation is essential. The minimum size for a jury room to provide for a comfortable arrangement of furniture and adequate space round a central table which has to seat the twelve jurymen is 20 ft by 14 ft and a rather greater area is very desirable. The points outlined above in connection with lighting and ventilation in connection with the judge's room apply equally to the jury room, while the internal position away from external walls is of great importance for both reasons of privacy and quietude. A typical layout of a jury room is also shown in Figure 13, together with its relationship to the main circulation, court room and the internal lighting areas; this figure is based on the placing of two court rooms side by side and, in consequence, the central area serves as a lighting source for both the jury room of Court No. 1 and the judge's room of Court No. 2, since it is desirable to keep the jury on the same side of the judge in both courts.

Barristers' Rooms—The principal room used by barristers is a robing room, which is generally about 750 sq. ft. in an Assize Court building having two or three courts. The room is fitted with a considerable number of lockers for clothes, papers, etc., and is generally furnished with writing tables, chairs and some easy chairs. It is usual for this room to have a position on the exterior of the building, but such a position should be chosen to avoid overlooking streets carrying heavy traffic. Adjoining the barristers' robing room should be ample lavatory and W.C. accommodation for both sexes.

A room of some 400 sq. ft. in area is needed adjoining the barristers' room for the use of the barristers' clerks; this room should be fitted with lockers or hat and coat hooks, and should be furnished with tables and chairs. The consultation rooms, of which two or three at least should be provided, require an area of about 150 to 200 sq. ft. each. A quiet position, both as regards external traffic noise and noise from internal circulation corridors, is very important. The rooms are usually simply furnished in the manner of a board room, with a single large table and a number of chairs.

A special consultation room or visitors' room is needed as part of the prisoners' accommodation on the floor below the court room for prisoners to use when in consultation with their lawyers and for interviews with friends.

Rooms for Officials—The private rooms or offices for the important officials of the Court, such as the Sheriff and Clerk of the Assize, require a floor area of at least 200 sq. ft. and are better if somewhat larger.

The offices for the more important officials should be grouped together, and it is preferable if those for the Sheriff and Under-Sheriff are placed together and near the court most likely to be used for criminal cases. A private lavatory adjacent to the rooms for the chief officials is frequently provided. A room for payment of fees and for the use of the Taxing Master should be in close proximity to the Assize Hall and the courts, although grouped with the remainder of the offices; this room usually needs rather more floor space than the normal individual office. All other accommodation for officials is in the nature of normal offices, the detailed planning of which does not require special comment in this section.

Solicitors' Rooms—A retiring room for solicitors (about 500 to 600 sq. ft.) with lavatory and W.C. accommodation for both sexes adjoining, equipped and furnished as the barristers' robing room, is required; it is usual to make this room rather smaller than the barristers' room as many of the solicitors return to their offices between cases and only use the retiring room as a cloakroom or room to consult or instruct their clerks, etc., before or between cases. A solicitors' clerks' room, as for barristers' clerks, is needed with similar equipment and furnishing; it should have an area of about 300 to 400 sq. ft.

14. *Museums and Art Galleries*

Scope—This section is devoted to the planning of public museums and art galleries, limiting the range of types to those in control of national, municipal and public authorities, excluding all reference to museums and art galleries constructed for private use either by individuals or dealers in works of art.

Introduction—Museums and art galleries are usually associated together and housed within the same building, excepting for certain of the larger national collections, which, by reason of their size, require separate buildings.

Museums and art galleries have to satisfy two main groups of users, first, the general public and casual visitors and, secondly, students and research workers.

The galleries not only have to provide accommodation for permanent and semi-permanent exhibits, but also for special exhibitions which may be held from time to time, when objects of many different categories may have to be displayed.

The sizes and classes of articles to be displayed in museums or art galleries vary considerably and sections or even whole buildings have to be devoted to such subjects as applied art, including furniture, tapestry, pottery, jewellery and ironwork; ethnology; science, including engineering, natural history and geology; trade and industrial museums; folk museums; and art galleries for the display of sculpture, painting, engraving, portraits and miniatures. The division of the types or classes of exhibits is somewhat difficult to mark clearly; when it is necessary to separate them into different buildings certain overlapping may be unavoidable.

Most larger towns are able to group the whole of the museum and art displays in one building, although sometimes it is found desirable to keep certain collections grouped in separate buildings, or form special museums for one or more groups of exhibits, such as natural history or local folk or industrial exhibits.

In many districts some provision is necessary for the display of exhibits in the open air, either in courtyards of museums or, when whole buildings are involved, as might be the case with folk museums, in special parks or gardens.

Provision should be made for lectures to be given in conjunction with displays and for this purpose a properly equipped lecture theatre with facilities for a lantern and sometimes for a cinematograph apparatus should be planned.

The two main groups of users, namely, casual visitors and students, make the problem of the proper display of exhibits somewhat difficult and the two groups also have considerable effect on the design of the main circulations for the building; in many galleries certain exhibits have to be well and attractively displayed to interest the casual visitor, while the main possessions of museums may often be kept in special galleries and rooms out of reach and sight of casual visitors, for the use of students only; but at the same time the exhibits displayed for visitors must be available and be shown in such a manner that they are useful to the serious student.

Museums and art galleries must be designed in a very flexible manner, as it is impossible to anticipate the nature of the future acquisitions or bequests; these may be single pieces or whole collections of articles, either small or large, which must be displayed as a whole.

The actual settings for exhibits are a somewhat controversial matter, but it is very certain that exhibits must be given settings in keeping with the exhibits and not of such a nature that they detract from the objects displayed.

Sites—The choice of sites for museums and art galleries is seldom a matter on which the architect is called upon for advice, but when this is possible it should be borne in mind that such buildings are important public buildings demanding good sites and good site-planning. Space for future extension is desirable, but as many museums are built on urban sites, facilities for extension are often impossible. Urban sites centrally placed are probably more advantageous than less crowded situations on the outskirts of towns, involving considerable travelling for the majority of visitors, students and staff; those museums and galleries which are centrally placed are likely to be of greater benefit to the community, especially in connection with temporary special exhibitions. In any modern project, car parking facilities should be allowed for, and must therefore enter into the general site considerations from the initiation of the scheme.

Many museums and art galleries have to be multi-storied buildings, since central urban sites will not always permit of building on one main floor only; consequently side-lighting only is available for the galleries placed on the lower floors over much of the site area, but, by careful consideration of the section, top- or high side-light may be made available for a number of rooms, leaving the remainder for use where normal side-light from windows is suitable for the particular objects to be displayed. Further consideration of the factors controlling the lighting of galleries is given later, when detailed planning of the rooms is considered.

Circulations—The circulations to be considered when planning art galleries or museums may be divided into three main groups: first, there is the public circulation both for visitors and for students who wish to see the exhibits; secondly, the goods or exhibits circulation from the point at which they arrive at the building until they reach their final position, and for movement afterwards to new positions or for renovations; lastly, the administrative circulations affecting the whole staff, comprising curators, attendants and cleaners.

Figure 1 illustrates in diagram form the essential circulations involved in a museum building. The public enter from the main street front and, for purposes of supervision, it is desirable to have one public entrance only. At the entrance should be placed facilities for general inquiries, stalls for the sale of catalogues, guide books and photographs, and cloakrooms where clothing, sticks and umbrellas may be deposited. Lavatories are needed for the public, and it is often convenient and advantageous to place these in a central position near the entrances, but perhaps at a different level, as, for instance, in the basement or lower ground floor levels. The diagram shows alternative treatments (A and B) of the central space around which the galleries are placed; this space may either be used as an open courtyard or as a central hall, The building indicated may be of a single or multi-storied type, with either treatment of the central space; but if light is not available from the courtyard the span of the encircling galleries would probably need to be less than when there is a secondary internal source of light. In either type, the central space should be available as a secondary circulation, so that it is possible to return to the entrance without completing the full circulation of the galleries. The entrance for goods should be provided at the back or side of the building and should lead to rooms used for unpacking, repairs and other administrative purposes. This entrance should deliver

to the main goods circulation of the building, which will involve a lift or hoist for handling the larger and heavier objects between the entrance level and the galleries ; these hoists may be placed almost anywhere in the building to suit the convenience of handling the objects from the workshops to the galleries.

The staff in smaller museums often use the main entrance, but in larger schemes the staff entrance is grouped in the same control as the goods entrance. Staff rooms should be placed in good relation to the entrance and work rooms.

The rooms for the use of officials, staff and students have to be distributed in various parts of the building, partly in conjunction with the galleries and partly, as, for instance, the workshops, in relation to the circulation of goods.

Entrances—There should be only one public entrance to any building of this type in order to reduce to a minimum the control and supervision of the building. It is usual to have the main door or doors open during the hours when the public are admitted and to have two sets of inner doors, one for each direction. Inner draught doors may be of any of the usual types, but should open in the direction of the traffic ; revolving doors have the advantage of assisting to preserve even temperatures in the entrance hall, and reduce draughts from much used doors.

Some galleries and museums require turnstiles to control all persons entering and leaving, either to count the persons visiting, or because charges for admittance are made on certain days of the week. In some buildings turnstiles are required on certain days only, and a portable type of fitting is often used for this purpose, and taken away and stored on " free " days. It is preferable if the turnstiles can be planned in such a way to leave space for an inquiry counter, and possibly access to certain offices, before arrival at the point of control.

At or near the main entrance should be grouped various facilities for visitors, such as cloakrooms, public telephones, toilets, information and sales counters. Small buildings usually have one counter at which inquiries and sales are dealt with ; but in larger schemes very much more counter space is essential for the display of books, pamphlets, postcards and photographs and then the information and inquiry counters should be separated ; in addition to the actual sales counters there should be some space, such as a small room available for storage of reserve stocks of the various publications, etc., offered for sale.

Many museums and galleries require all parcels, sticks and umbrellas to be deposited by visitors, so that cloakrooms with counters fitted to take these articles, together with clothing, such as overcoats, which visitors may wish to leave, are essential. These cloakrooms and counters must be placed in the main entrance in such a position that visitors pass them before entering the galleries. It is preferable if clothing is hung up on numbered coathangers with hat-racks over as already detailed in the section on " Factory Buildings," and screened from public view ; the face of the screen may be used for umbrella racks and the under part of the counter should be fitted with shelving to receive parcels, bags and similar larger articles.

It is very important that the cloak counters as well as all other counters should be designed as part of the general lay-out of the entrance hall and planned to direct visitors along the main circulation and not to interrupt easy circulation.

The entrance hall is the hub of the circulation, through which all visitors enter and leave, and consequently must not be too cramped in area ; there should be ample space in which to allow parties to assemble to await guides and lecturers without obstructing normal circulation of visitors.

Multi-storied museums should be equipped with passenger lifts serving all floors and these should be planned in a position convenient for the main entrance, so that visitors may go directly to whichever floor they desire without passing through any of the ground floor galleries.

The lavatories for visitors should be placed near the entrance, although they need not be approached directly from it ; in many schemes they are placed in basements or at lower ground floor levels reached by staircases from the entrance hall.

Figure 2 illustrates a typical entrance for a small museum or are gallery. There is a pair of main entrance doors which are opened back during visiting hours, leading into a lobby in which two revolving doors or pairs of swing doors are placed, one for entrance and the other for exit. Inside the revolving doors is a space between the entrance doors and the turnstiles, which must be sufficient to prevent congestion between those entering and leaving the building. Inquiries may be made if necessary at the counters without passing through the turnstiles, as the latter are planned with two faces, one to the lobby and the other to the main hall.

The turnstiles are arranged to separate those entering and leaving, the turnstiles proper controlling the entrance only.

The counter arrangement shown on Figure 2 provides for cloaks on one side and for information and the sale of publications on the other side of the actual entrance. By using the space needed for the lobbies and turnstiles ample space is available for hat and coat racks screened from view, and for working and storage space on the sales side ; part of the sales side may be screened to provide for bulk storage out of sight, while the screen itself acts as a display stand. The actual length of counters and the area of the space needed both for cloaks and sales is entirely dependent on the size of the museum, but if, in the future, additions are likely to be made to the gallery buildings, the entrance hall and counters should be designed to provide the accommodation essential to the building when it reaches its ultimate limits.

As the screens behind the counters do not need to be more than about 7 ft in height, ample light will be available for the counters from windows placed on the external walls, more particularly as the height of the entrance hall is likely to be at least twice or three times the height of the screens.

Figure 3 is an alternative to Figure 2, and shows a typical entrance to a very large museum building. Three outer sets of doors give access to a

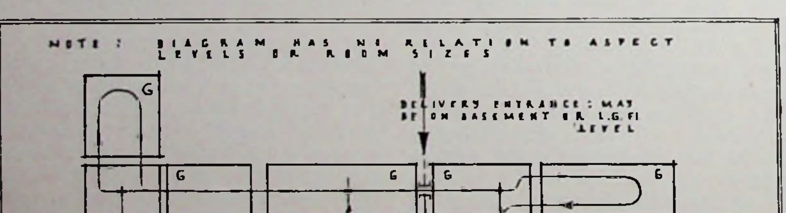


Figure 1

vestibule, in which are placed three inner sets of swing or revolving doors. The inner control is by means of turnstiles placed at each end of a dwarf cut-off barrier for those entering, and shows doors in the central position for exit purposes, thus separating the traffic as much as possible into two streams.

Immediately adjoining the entrance turnstiles are the cloak counters and cloakroom spaces ; these are divided into two groups, which can only be justified in a really large building because of the duplication of staff, but when justifiable assist to preserve good circulation, as persons entering by either turnstile must pass close to a cloak counter.

Opposite the cloak counters on each side on the main axis leading to the central hall are placed counters for information and sales, which in a large

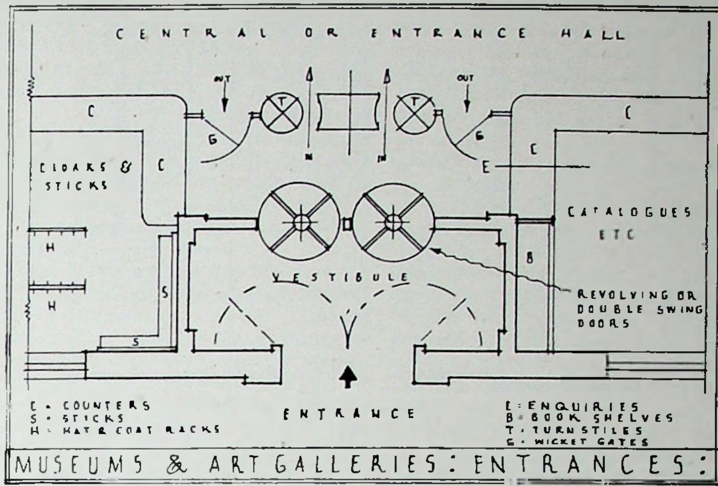


Figure 2

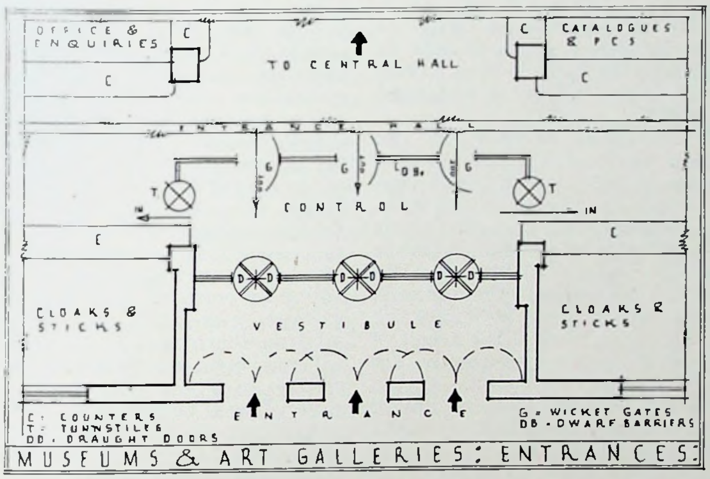


Figure 3.

building require a very considerable length of counter to accommodate many persons at the same time, and to display effectively a large number of publications.

The counters are continued on each side of the approach vestibule to the central hall. A very large area is essential for an entrance hall in a museum of the type suggested, since it is the central concourse where congestion and ambiguity as to circulation must be avoided.

Public Circulation—There are various problems which arise in connection with the arrangement of circulations through buildings of the gallery type and a number of different methods of planning have been tried in existing buildings, each of which has points of special value for varying kinds of exhibits.

Convenient arrangement of galleries and other spaces used either for display or study to permit of future reorganisation is essential, as in most schemes it is quite impossible to anticipate what form acquisitions and gifts may take in the future.

The method of lighting galleries has considerable bearing on the number and arrangement of floors, since the lower floors of multi-storied buildings can only have side-light over much of the floor area.

Dead ends in circulation should be avoided in galleries having exhibits mainly on one side, as in galleries with windows on one wall only, but where the lighting permits of circulation within a gallery, visitors may pass along one side and return along the other wall.

In some schemes, visitors have to circulate through whole wings, floors or even the entire building, as there is an obligatory circuit which visitors must follow without turning back ; such an arrangement is often very tiring and is most inconvenient for those, especially students, wishing to proceed directly to some particular group of exhibits. It seems desirable, at least in large buildings, to arrange the circulation so that it is possible to reach each section from the main entrance with the minimum amount of walking and passage through other sections.

A type of circulation which has some advantages is one that has a main route through a number of galleries showing various groups of exhibits and making, where possible, minor circulations in each group for those visitors desiring to view a greater amount of any special display.

Another scheme of circulation layout is based on a circulation corridor from which all galleries are approached, so that visitors pass the openings or doors to all galleries, but only enter those in which they may have a particular interest.

Certain circulations, such as those to offices, may have to be available at times other than those when the galleries are open and therefore they should be arranged in such a manner that the gallery circulations may be cut off, but without the introduction of a separate external entrance which involves additional supervision.

Figure 4 illustrates two types of circulation for museums or art galleries ; Diagram A shows the circulation passing through the galleries, and Diagram B is based on a corridor system for main circulation, with series of galleries approached from the corridor. The placing of doorways or openings between galleries depends partly on the source of light and partly on the necessity of leading visitors past the exhibits in a particular way to suit a definite arrangement of objects. It should be noted that in Type B some galleries are approached through others and do not each have separate access from the corridor.

The corridor in Type B may be artificially lighted, if not on the topmost floor, in which case rooms may be placed on the side opposite to the galleries ; these rooms may be used as galleries, often of a smaller size, or for such purposes as offices, study rooms, store rooms, or even toilet rooms. This type of plan offers excellent opportunities for the provision of study rooms and rooms to house exhibits not normally available to the visiting public in close proximity

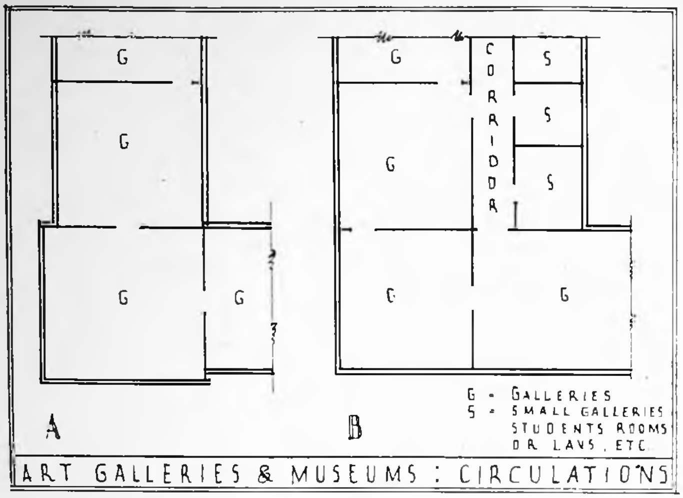


Figure 4

to the main galleries in each section in a manner which is often difficult to plan in a scheme based on gallery circulation only, as in Type A. Type B also makes easier the closing of a group of galleries for rearrangement of exhibits or while a temporary exhibition is being arranged or removed.

Doorways between galleries as in Types A or B may be placed either close to or far away from the window wall, or centrally on the axis of the room ; each position is dependent on the type of exhibit to be shown, the placing of the windows or other light sources and the cross section shape of the gallery.

Galleries—The actual planning of rooms to be used as galleries in regard to size and shape does not require any particular detail consideration, but is mainly a matter for planning in conjunction with the method of lighting and the purpose for which the gallery is to be used. The rooms are virtually shells in which varying types of exhibits may be shown, excepting generally that a room designed to provide proper lighting for pictures is unlikely to be required for the display of furniture, panelled rooms or ceramics in cases. In buildings to be used for varying purposes space allocations may be made by selection of suitable plan positions to give the correct method of lighting desired for any particular group of exhibits ; for instance, topmost floors or other positions where top- or top-side-light is available, are probably better suited for the display of pictures, while furniture and articles in cases may be perfectly satisfactory with side-light from windows only.

Figure 5 illustrates typical gallery plans where top-light is not available and the rooms depend upon windows either at normal or high level for daylight. Exhibits of all types may be shown in such rooms, although they may not be ideal as picture galleries ; side-light for pictures may be perfectly adequate if provision is made to obtain the correct angles of light on the pictures by using screens having different plan shapes as suggested on Figure 5.

The variations between the two diagrams are that Type A has light available on one side only, while Type B has windows on both the long walls.

The window area and particularly the height of windows, influences the width to which galleries may be planned ; in normal circumstances galleries may be 20 to 30 ft in width and very much more if the height of the gallery, and consequently the window heights, will permit. A good general rule for normal galleries lighted from one side is 10 to 12 ft in height, which may be increased so as to be equal to the width of the gallery. For many purposes high galleries are not needed, but many picture galleries where large paintings are to be shown may need to be at least 12 ft high, while certain other galleries for sculpture and other large objects may need very much more.

Windows should be about 3 ft to 3 ft 6 in from the floor to the sill, and should reach up to about 12 in from the ceiling if flat, or from the springing line if segmental. However, in some galleries high side-light may be needed and in these circumstances the sill level may be 6 or 8 ft above the floor level, thus permitting medium-sized pictures or exhibit cases to be placed below the windows. Such high side-lighting implies generally that the major objects are displayed in a central position or on the wall of the gallery opposite to the light source.

Room sizes, particularly the height, should not be such that they dwarf exhibits, as is possible if, for instance, small pieces of furniture are shown in very large and high rooms.

Since top-light is so very important and preferable to side-light for the lighting of galleries for many purposes, it is often necessary and desirable to design the section of multi-storied buildings in such a manner that by the introduction of set-backs on upper floor levels, top-light may be arranged for many additional rooms.

Figure 6 shows two plans and sections where set-backs have been planned in order to provide top-light to rooms on lower levels which could only be side-lighted from windows if all the floors had the same span. Type A has two galleries on the lower floor and one gallery above placed centrally on the span of the lower floor and, in consequence, all the galleries on both levels can be provided with top-light with or without the addition of side light as desired ; the circulations in this example must be through the galleries themselves on the upper floor, but a corridor can be placed on the outside of the lower floor galleries, if required, to avoid the necessity for staff, students or visitors to circulate through the galleries.

Type B on Figure 6 shows a building having four floors in all, but, if necessary, the lowest floor might be a basement or lower ground floor for service use, or it might be used as ground floor galleries, or, alternatively, it could be omitted when a large number of side-lighted galleries or service rooms are not required. The planning of the lower two floors is based on corridor circulation for access to galleries and other rooms and these circulations are lighted either artificially or by borrowed lighting from the galleries on each side. The first floor level on the section has the outside galleries on one side top-lighted by the setting back or narrowing of the gallery over it and, by the elimination of the corridor on the second floor ; this setting-back on the second floor provides a narrow gallery with top-light available, as there is another set-back on the third and top floor ; narrow galleries of the type suggested are often greatly appreciated in museum buildings and are useful for the display of a number of different types of objects. The topmost story is top-lighted ; here the galleries are planned on the non-corridor basis of circulation.

The raking line of the one side of the section discussed above is very useful when courtyards are planned on ground floor levels, as the setting back reduces the effect of enclosure produced by high surrounding walls and assists very greatly the lighting in a courtyard and its surrounding galleries. Also, the vertical line of the façade on the other side of the section may be very useful in connection with the elevation to an important surrounding street. All the windows on the one façade may be designed as similar-sized openings, since they light galleries of similar span on each floor. Side-light, and consequently windows, are unnecessary for the topmost story.

There are a large number of variations of plan and more particularly section, which can be based on the idea of the setting-back of upper floors, and Figure 6 must be considered

only as a suggestion and basis for explanation. The criticism that much possible floor area is lost by the setting back of the upper floors may be more than counterbalanced by the gain in more desirable lighting for the floor and wall areas provided.

Top-lighted Galleries—Top-light is of the utmost importance for many museum and art gallery purposes, although the light and the direction in which it passes must be controlled to suit the types of objects to be displayed; in conjunction with the display of many objects an evenly distributed light over the whole area is all that it is necessary to provide, but for many other objects, and especially for pictures, the light must be directed and controlled in particular ways in order to provide the right type of light and the elimination of reflections. For the display of pictures the source of light should be limited and so controlled that it is strongest on the parts of the walls which are used for the actual display and weakest where the observer stands. The source of light should be behind the observer whenever possible. Much may be achieved by the correct selection of the type of glass to be used for screens or laylights through which the light enters the gallery. The glass may be chosen not only to diffuse and distribute the light evenly, but also to transmit the light in a given direction.

Much experimental work has been carried out in connection with the lighting of picture galleries by many research workers, and among various detail writings which may be found useful are a Report by the National Physical Laboratory (Illumination Research: Technical Paper No. 6. 1927, H.M. Stationery Office, price 1s. 6d.), a paper read by Mr. S. Hurst Seager (*R.I.B.A. Journal*, January 13, 1923), and a series of articles on "Modern Museum Lighting" in *The Architect and Building News* by Dr. Hannema and Mr. A. van der Steur (September 20, 27, and October 4, 1935). From these writings may be gleaned much information regarding what lighting is desirable and how it should be provided, but any complete and infallible solution of the problem does not appear yet to have been arrived at.

There are many alternative types of sections of galleries recommended by different authorities on the lighting of pictures, in addition to the various sections that have been tried in actual buildings; the following diagrams have therefore been chosen to serve as a general basis for explanation of the different types available and the effect each type has on the lighting.

The reflections to be considered are those of the source of light, of other pictures on end walls or opposite walls and of the observer himself. Direct strong daylight must be avoided on pictures, but at the same time there must not be too great or uneven diminution of light on the pictures.

Figure 7 illustrates two typical picture gallery sections, both of which may be duplicated side by side if desired, giving two circulation spaces adjoining. Each type shades the spectator from direct light and concentrates the light on a limited portion of the wall only. The spectator is screened from reflections from the light source in each example; as in Type A he is either in the corridor space or, alternatively, adequately screened although actually in front of the source of light, while in Type B the ceiling is so shaped as to achieve the same effect.

In Type B the wall on which the

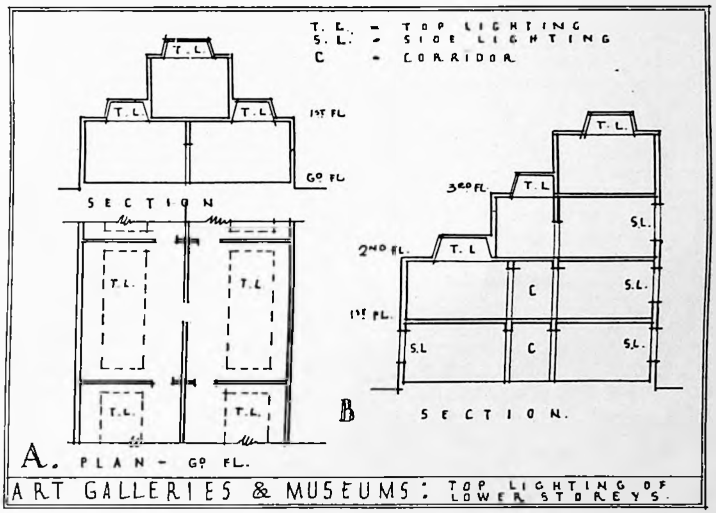


Figure 6

pictures are hung is slightly sloped to avoid still further the reflections of the light source from the pictures, particularly when these are glazed; a similar treatment may be provided in Type A.

In Type A the spectator stands in very subdued light, as it is produced by the reflected light from the curved ceiling only and in Type B this source of light is still more reduced. Type A allows the spectator to stand nearer to the picture than Type B without himself being within direct light rays.

The light on the walls should be stronger than on the floor, and therefore the angles and sizes of ceiling and lights must be so arranged as to concentrate the strong or direct light above the floor level.

Figure 8 illustrates further important points relating to the sections of galleries with top and clerestory lighting. The important factor is that the angle of reflection of light from an object is equal to the angle at which the light strikes the object, and

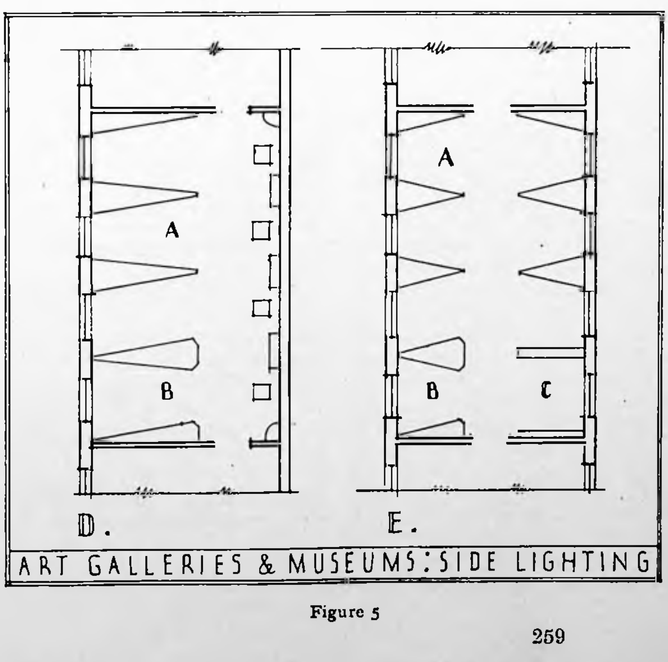


Figure 5

consequently the angles from the source of light, namely, the top-light or clerestory window, must be so arranged that the reflection is not visible to the observer of the object. Figure 8 shows how different heights of section in galleries are necessarily changed with each type of lighting in order to give the same control of reflection. It should be borne in mind that the quantity of light available with an horizontal skylight is greater than when clerestory or a reversed lantern-light is used, but the quality of the light on the objects is usually very much better with the latter types. Figure 8 A shows that by the use of the inverted lantern-light type of section the galleries do not need to be very high to secure good illumination on objects hung on the walls and, in fact, if the section height is raised, the reflections immediately become troublesome. When a flat laylight is used under a normal top-light or lantern, the section height must be raised considerably, as shown in Figure 8 B, to obtain the same angle of light and consequently controlled reflections. If clerestory lighting is to be used without the introduction of laylights which reduce the glass area on the ceiling through which light can pass, the ceiling has to be raised to a very great height, as shown in Figure 8 C. The comparative heights are very clearly indicated on the figure and from it may be appreciated the economy in structural costs that can be achieved by the introduction of the inverted lantern-light or any other similar sections as illustrated in Figure 7, which concentrate the source of light on the object from windows or lights placed at comparatively low ceiling levels. Any sections based on clerestory lighting types, such as Figure 8 C, should have windows on two long sides of the gallery only and not on the end walls. If placed on one end wall, reflections are caused on the walls opposite the source of light, and to some extent on the side walls. The length of the rays from the source of light to the object causes reflections on the end walls owing to the increased distance, even when the height of the source of light is controlled to give satisfactory results on the side walls.

Figure 8 is based on permitting the observer to approach to within 6 ft of the object with an eye-line of 6 ft above the floor; it may, therefore, be considered desirable in many schemes to change the angles a little and base them on an eye-point of a smaller minimum distance from the object and a lower height. The farther the eye-point moves away from the object on the wall, the less the likelihood of reflections.

Figure 9 stresses still further the varying heights of galleries to achieve the same control of reflections, but also illustrates clearly the progress that has been made in the methods of providing light in the galleries. Diagram A shows the general method of lighting which has been widely used; it provides a large amount of light, but much of it falls on the floor and on the observers instead of being directed on to the walls where it is most needed. Further objections to this form of lighting are that the source of light is visible from all parts of the room, that there is excessive glare, and that considerable height is essential to avoid serious reflections.

Diagram B in Figure 9 shows ordinary clerestory windows which require, as previously stated, even greater height than the horizontal laylight with a skylight over; this type of lighting is better than Type A, since the walls receive more light and less is directed on to the floor and spectators.

Diagram C shows a form of lantern-light, but without the top or roof glazed; many of the disadvantages of clerestory lighting inherent in Diagram B are avoided, particularly as regards excessive height, although considerable height is still needed to control reflections. In this type, as in Type D, the main structural beams usually have to cut across the opening under the light and are visible in the gallery.

Diagram D in Figure 9, which shows the inverted lantern-light type based on the lighting systems advocated by Mr. Hurst Seager, has various advantages over the other three types shown. Light is concentrated on the objects, spectators are in the shade, there is very little glare, all the walls may have direct light since windows at each end of the lantern cannot be seen by spectators and lower section heights are necessary. The diagrams

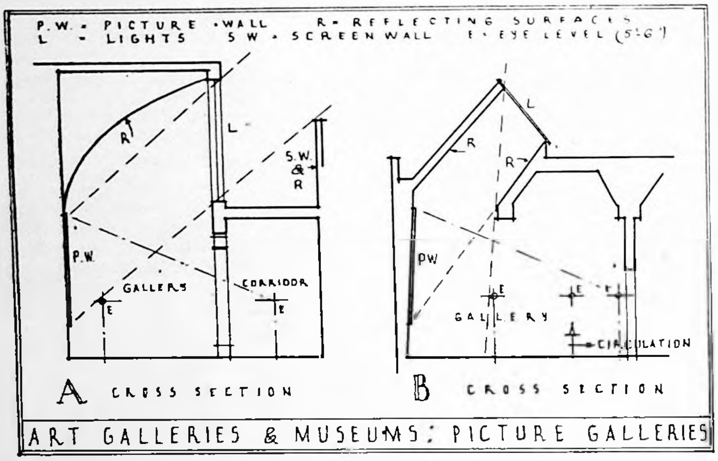


Figure 7

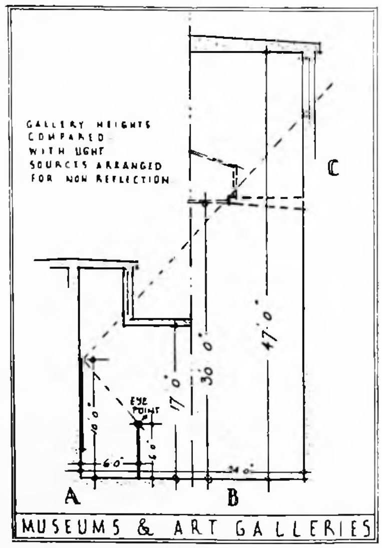


Figure 8

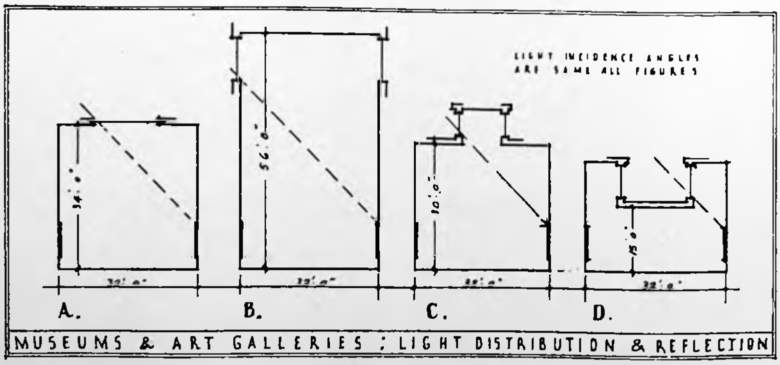


Figure 9

in Figure 9 are all based on galleries of the same width and the section heights necessary for each type of lighting when the reflection angle is similarly controlled are marked. It should be noted that the clerestory type requires nearly three times the height of the inverted lantern type.

Figure 10 illustrates an example of a gallery section based on a development of the inverted lantern type. It should be noted that there is a normal outside glazed roof which provides light for the glazed sloping laylight on the gallery ceiling ; this laylight is continuous round all the walls of the gallery and concentrates the light on the walls where it is most needed and leaves the spectators in an area lighted by reflected light only and consequently of a less intensity than the walls.

Since artificial light is of very great importance in galleries, the design of the installation must be considered in conjunction with the source of natural lighting. If the daylight sources have been designed to provide definite conditions, it is essential that the artificial light should reproduce similar conditions. It is desirable, therefore, that the artificial lighting be placed when possible behind the laylights or lanterns. The section shown in Figure 10 allows for such an installation to be placed behind the sloping laylights and to be accessible from the false ceiling for maintenance, thus daytime lighting conditions as regards sources of light are almost exactly reproduced. It should be remembered when designing false ceilings, as suggested in Figure 10 or Figure 9 D, that the false ceiling must be strong enough to be used as a means of access to clean the insides of the roof lights and laylights and to attend to artificial lighting.

Galleries to be used for the display of normal museum exhibits, apart from pictures or sculpture, do not need such special consideration from the point of view of lighting, since exhibits are either not placed in cases or are examined by the observer standing close to the glazed cases, in such a way that reflections do not cause much inconvenience ; in fact, lighting is often installed inside the cases themselves which eliminates any possibility of reflection. Museum galleries may, therefore, be normal side-lighted rooms with windows, or top-lighted with the usual lantern-lights with interior lay-lights on the ceilings. Rooms for such uses do not need very great height, since few exhibits are great in height and the majority are small objects in cases which cannot be seen adequately if the cases are much above normal eve-level. The gallery heights should, therefore, be controlled in most instances by the dimensions of the floor area in order to give pleasant proportions.

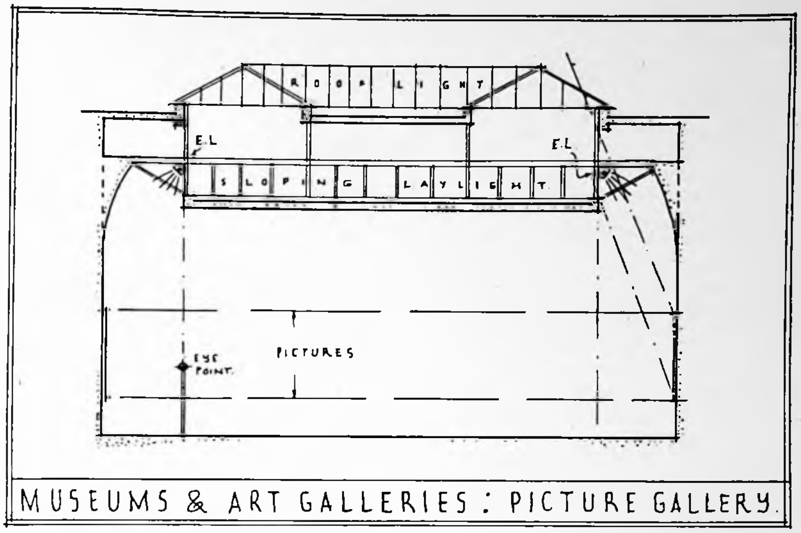


Figure 10

Temporary Exhibitions—When special provision is made for temporary exhibitions—a usual requirement in most museum buildings—it is desirable to have a suite of rooms which includes at least one large and one small gallery. This suite should be placed near the main entrance hall for the convenience of special visitors and to avoid the necessity of the public having to pass through other departments or sections to reach the special display. It should not, however, be so placed that it interrupts main circulations, since the suite is often closed while the exhibitions are being changed. It is desirable that these galleries may be cut off completely so that the noise caused by the frequent moving of exhibits does not disturb the quietness of other sections of the museum. It is essential that a goods lift is placed near this suite of galleries for the rapid and easy movement of exhibitions. The unpacking and cataloguing rooms should be near the lift serving these rooms and may be placed in a basement or on the lower ground floor.

Facilities for Students—In most museums and art galleries housing a large number of exhibits a large percentage of the total are often not normally displayed for reasons of lack of space, or to avoid showing the public too much of any type of object. These surplus exhibits are of great importance to the museums and particularly to students. Various types of storage galleries have been tried in different museums and each appears to have certain advantages over the others. The important factors seem to be that all exhibits must be easily and quickly accessible and that they may be easily handled by students and curators ; at the same time, it is essential that desks or working tables should be placed in close proximity for the research workers to make notes and write. The type of room and its equipment must necessarily vary considerably according to the type of objects to be stored ; ceramics, for instance, need cupboards and shelving, prints are usually kept in flat drawers and pictures and textiles are frequently stored on vertical sliding or swinging screens.

It is desirable that storage and study rooms be placed adjoining the galleries allotted to each department or section, together with any departmental rooms needed, such as rooms for the curator and his staff. These storage rooms may either be a suite of rooms in a wing or in a block of the building attached to the side of a long gallery, or a series of galleries approached from the side of one of the galleries ; or, in a corridor type of circulation, as previously described in the paragraphs on circulation, the smaller rooms on the opposite side of the corridor to that occupied by the galleries may be used for these purposes, or, alternatively, very wide galleries may be planned and a portion of one side screened off by cases or walls as illustrated in Figure 11.

Figure 11 shows a side-lighted main gallery with screens for exhibits near the windows, island cases in the centre of the room and wall cases against the partition separating the storage rooms. This partition and the cases placed against it need not be more than 9 or 10 ft in height, thus allowing some light to reach the storage rooms. When the galleries are on upper floors or where set-backs can take place above the corridor, clerestory lighting over the normal corridor height can be used to provide additional light to the storage sections. The storage rooms in this example are fitted up with cupboards on each wall, excepting in certain portions on one side where writing desks for students to work at are incorporated in the lower part with cupboards above normal headroom height. The depth of the cupboards is mainly dependent on the type of objects to be stored, but for most types of objects suitable for storage in cupboards a depth of 1 ft 6 in to 2 ft 10 in is usually

sufficient. The overall width from the partition to the corridor wall can thus be accommodated in about 7 ft 6 in to 9 ft ; the space between the faces of the cupboards should not be less than 4 ft, so that a person may pass an open door without risk of damage to any object or exhibit he may be handling. The desks should be at least 3 ft long and 2 ft wide, so that exhibits may be placed on them for examination while notes are being made. The doors from the corridor giving immediate access to the reserve rooms should not serve as approaches to the galleries, and also it may be considered desirable to hang an additional door on the line of the partition separating the reserve space and the gallery.

Figure 12 illustrates one method of fitting up reserve rooms which are to house pictures, textiles, wallpapers and similar exhibits which need flat vertical screens as a storage method. The screens may be made of wire mesh to which pictures may be hooked, or wood or wallboard panels to which they may be pinned ; the wire screens permit access to the backs of the pictures for examination without their removal from the screen. These screens should be supported from ceiling tracks and, if possible, floor tracks should also be provided, since the screens may be very heavily loaded. This screen arrangement permits the provision of a very large storage space within a comparatively small floor area, and all the exhibits are readily accessible for examination. Screens can be the full height of the room and require twice their length plus about 7 ft as space for circulation round the screens when drawn out into position for examination and for writing tables and desks. Good but normal side lighting is necessary, but not any form of special gallery lighting, since, when important examinations are to be carried out, the exhibits may be removed for inspection in concentrated natural or artificial light. The screens should not be placed too close together, as frames may have considerable projection, and a normal spacing of 12 in will usually be found desirable. A flat and specially constructed ceiling for the fixing of the tracks for the screens is needed at the level of the underside of any normal beams.

Figure 13 illustrates another type of arrangement for study rooms and storage of exhibits. Three levels of storage cupboards are provided in the normal height of one exhibition gallery ; these cupboards are provided with access gangways on three sides of one or more small rooms, leaving the centre portion of the room clear for desks or tables at which students may work. The fourth wall may be largely occupied by windows to provide ample light for the whole room. The upper tiers of cupboards and the access gangways are reached from staircases placed in the depth of two sets of cupboards planned back-to-back. By this arrangement the whole wall areas may be covered with cupboards, all of which are within normal reach, since the gangways limit the heights to about 7 ft, whereas without the additional or upper tiers, cupboards have to be limited to about the height of the lowest tier, unless steps or ladders are used for access to the stored objects, which is to some extent dangerous. A further advantage of this scheme is the concentration of a large number of stored or reserve objects within very easy reach of a student. The storage spaces are placed very close to the main galleries but, at the same time, they are completely cut off from them, thus permitting absolute quietness for study.

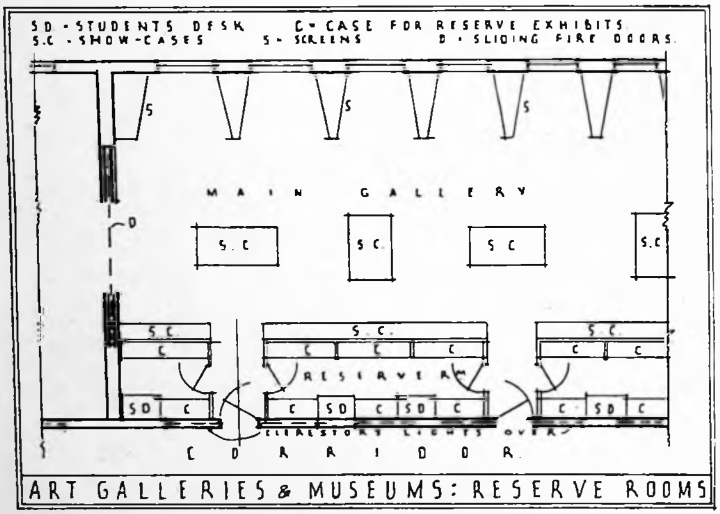


Figure 11

Lecture Halls—Provision of a suitable room for public lectures is often required in conjunction with the work of museums and art galleries. Such lecture rooms may be required to seat as many as 500 persons, although generally much smaller rooms are sufficient for the purpose. These rooms should be easily accessible from the main entrance vestibule without visitors having to pass through any of the exhibition galleries ; a suitable position may often be provided at basement or lower ground floor level approached from staircases leading from the entrance vestibule, thus obviating the necessity of providing special control and cloakrooms. Artificial lighting and ventilation are sufficient, as the rooms are only used from time to time and not by the same persons continuously. An alternative arrangement, although far less satisfactory, is to use a gallery normally used for temporary exhibitions.

The necessary information regarding the planning of seating for rooms of this type, which usually have level floors, is given in the sections on

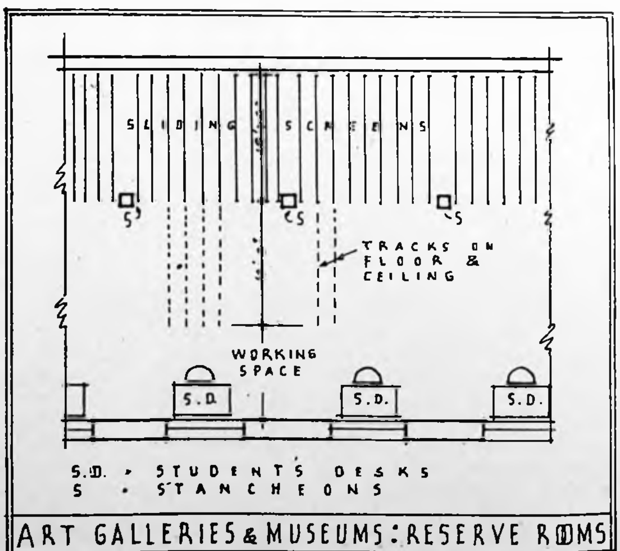


Figure 12

"Schools," "Community Centres" and Assembly Halls in "Municipal Buildings." If sloping floors are used, it precludes the use of the room for most other purposes, but it may be desirable in some schemes, as, for instance, where scientific demonstrations may be likely to be given, to restrict the purpose of the room and introduce a sloping floor and seats in tiers, which permits visitors to have a better view of the speaker, any demonstrations and a cinematograph or lantern screen. Provision should be made in all lecture rooms in buildings of this type for cinematograph projection, which involves special planning of escape to conform to local regulations as already described elsewhere. Entrances and exits must also be planned to conform to the local regulations controlling buildings used for public entertainment.

Staff Rooms—Many rooms are needed for staff and working purposes in addition to those used by the general public. These rooms provide space for receiving, unpacking and cataloguing exhibits, together with workshops for various trades, according to the type of museum, where exhibits may be cleaned and repaired. Such rooms are usually placed in basements or on lower ground floors, but when possible, reasonably good daylight should be provided, especially in rooms used for clerical work or for crafts involving very "close" work.

Offices are needed for officials and their staffs for the general administration of the whole museum and often for each section or department. General management offices are usually grouped together, but departmental offices are better if planned in conjunction with the galleries of the department, so that officials such as curators are available near the exhibits in their charge. Lavatory facilities should adjoin departmental offices. A board room or committee room is sometimes needed and often this room, together with the general administration rooms, are grouped together with a separate entrance to avoid visitors having to pass through the museum galleries to reach the administration offices. These offices do not call for special comment, since they are normal office rooms, for which information has already been given in these articles in the section on "Office Buildings."

Rooms must be set aside as locker rooms for the uniformed staff, such as porters and custodians, who generally arrive at the building in ordinary clothes and keep their clothes on the premises; these rooms are planned as normal locker rooms. Lavatory facilities for staff use should be grouped with the locker rooms and workshops, separate provision being made for each type of staff as necessary.

Staff Refreshment Rooms—Mess rooms should be provided for porter, custodian and workshop staffs, and when there is a public restaurant or tea-room on the premises, these rooms should be planned so that they may be provided with shared kitchen facilities and sometimes for "cafeteria" type of service.

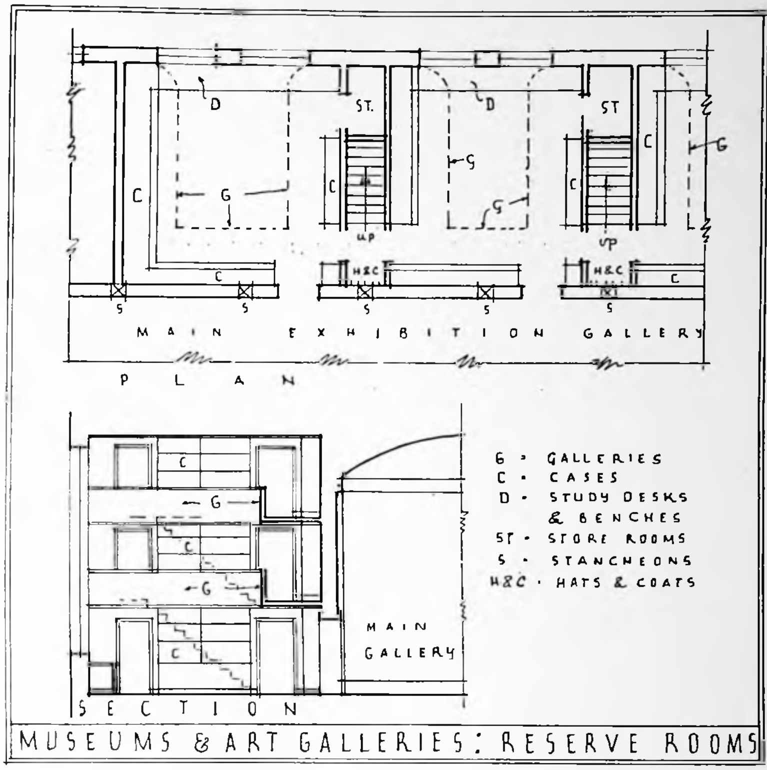


Figure 13

Photography Rooms—A special group of rooms is often needed for photography in conjunction with the receiving room and workshops, as in many museums all exhibits are photographed for record purposes; the rooms should comprise a studio equipped with adjustable lighting, a dark-room adjoining, and a negative store. Special fire protection should be provided for the latter as the negatives are often irreplaceable, as, for instance, photographs taken before renovations or restorations are made.

Cleaners' Room—Cleaners' rooms are essential on each floor and in large museums duplication may be necessary. These rooms should be placed in unimportant positions, possibly grouped with the administration rooms of each department. Vacuum cleaners and power installations for floor-polishing machines are needed as large areas have to be cleaned daily within comparatively short periods when the museum is closed to the public early in the morning and late in the afternoon.

Public Rooms—In addition to cloakrooms, lavatories, catalogue and book stalls already mentioned, restrooms and a restaurant are often needed in museums. These do not call for special planning other than the usual requirements of rooms for these uses. The official and office staff may also need a restaurant, which should be planned to be served from the same kitchen. A restaurant based on the "cafeteria" type of service may often be advisable, particularly to reduce the necessary staff to a minimum.

Safeguarding Exhibits—In general, museum authorities agree that the best safeguard for exhibits, both by day and night, is suitable and adequate patrol by custodians. Although in some rooms it may be thought necessary or desirable to install metal sliding or collapsible shutters and steel entrance doors, proof to a certain extent against theft, these precautions are generally quite limited in extent. The chief matter for consideration is concerned with protection from fire and with the provision of fire-fighting materials for extinguishing fires. To this end, the buildings should be, in structure and all furnishings and fittings, as fire-resisting as possible, with hand and trolley chemical extinguishers dispersed about the building on some properly planned and organised method. Fire mains (either dry or wet) with hose-boxes, etc., should be, in the main, kept to positions adjacent to the principal vertical circulations, where would also be located fire alarms and custodians' telephone-boxes or instruments.

Special boxes or recesses for custodians' day-time use are undesirable

as it is best that the men should patrol or sit in the actual galleries under their care. At night, the custodians should be able to patrol the entire building on some pre-arranged circuit or series of circuits at set intervals, and to this end galleries and other rooms should be planned with entrances and exits which permit this to be done. The positions for clock-recording instruments should be arranged in inconspicuous places. Certain rooms containing particularly precious exhibits (jewellery, etc.) may be required to be locked during the night and such rooms should be fitted with strong gates or with small shutters in the doors so that the patrol may examine the room without entering it ; night switches should, for this purpose, be placed outside the doors.

15. *Libraries*

Introduction — Library building covers a wide field and has many sections, different in some respects but having similar features. There are three main types of libraries; first, the private library serving only its owner who may be either an individual or a single commercial concern; secondly, the specialist library which is devoted mainly to the branches of one subject such as those attached to learned societies and faculties in a university and, thirdly, public and semi-public libraries, such as, in the former category, the town and county library and, in the latter, school and university libraries. Each serves one or more of the main purposes of a library which may be roughly subdivided as follows: Reference, newspapers and periodicals, lending and children's departments. Some libraries incorporate all the sections but this is not general.

Figure 1 is a diagrammatic attempt to illustrate the main principles of the library system which may be set up by a county authority or municipality. The central library is primarily the headquarters of the system and serves the public mainly through the branch libraries, except in certain departments. The main reference library and any special libraries form the central library, together with the stack and main work rooms which issue to the branch libraries. A small lending library may be attached to the central library but this is dependent on the distribution of the branches in relation to the population. Special collections, maps, and matter of local interest, together with a lecture room are usually attached to the central building. The main stack rooms serving the branches may or may not form part of the central library. In larger towns and cities economies may result from the attachment, due to saving in administration costs, but the site cost may be too great to justify the provision in a central locality of what is virtually warehousing accommodation. In county organisations the books are mainly or even entirely distributed to the public by means of the town and village branches in outlying areas, the central library thus being only a warehouse, together with the necessary rooms for the staff to look after and distribute the books.

Branch libraries are placed according to the situation and density of the population to be served, and are dependent to some extent on transport facilities. It is suggested by one authority they should not be more than one mile apart in evenly and well populated areas. The branch library is mainly concerned with the lending of books to be read elsewhere and therefore has only a few books of reference. Some branches develop beyond the purely lending library and require news-rooms, children's departments and a lecture room.

The smallest type of library is that which is termed a "delivery station," which is generally a room or a few shelves in a shop or institution in a sparsely populated or newly developed district, the books being supplied from the central depository. In this section it is not proposed to discuss the planning of national or exceptionally large libraries such as that attached to the British Museum, but to discuss mainly libraries for the use of the general public.

The Site—The site for a library should be chosen to give the maximum of quiet but at the same time it should be conveniently situated in relation to the population it is to serve. Good light and ample surrounding air-space are essential and consequently sites congested by surrounding buildings should be avoided if possible. Space for extension is necessary unless the new building is large enough to cater for the probable needs of 30 or 40 years ahead. If the site is bounded by a road carrying heavy traffic it is important that the building be set well back from it. When there is a children's section attached to a library it is desirable that the access should not be from a road carrying heavy traffic.

Orientation of the building is not of great importance although sunshine is more desirable in some rooms than others. Strong sunlight is not desirable in stack rooms (where it fades bindings) nor in work rooms, but its presence during part of the day in periodical and newspaper rooms is pleasant.

The Branch Library—Figure 2 is a diagrammatic illustration of the general relationship of the various rooms to each other in a branch library. Additional rooms may be required other than the accommodation suggested, such as rooms for special collections. A lecture room and study rooms may be needed but are not part of the essential space needed in most schemes. The rooms to which the majority of the public need access should be approached directly from the entrance hall and should be on the entrance floor level, while rooms less often visited, such as reference, study and lecture rooms may be placed elsewhere and on other floors. Each floor must be on one continuous level, and staircases should be placed so that they may be controlled easily. Exits from all public rooms must be planned so that they are under observation by the staff. It is also desirable that all or at least several of the public rooms be supervised by one member of the staff to avoid overseers or attendants in each room which is only necessary in exceptionally large schemes. Rooms must not, however, act as thoroughfares from one to another. The control point of the lending library

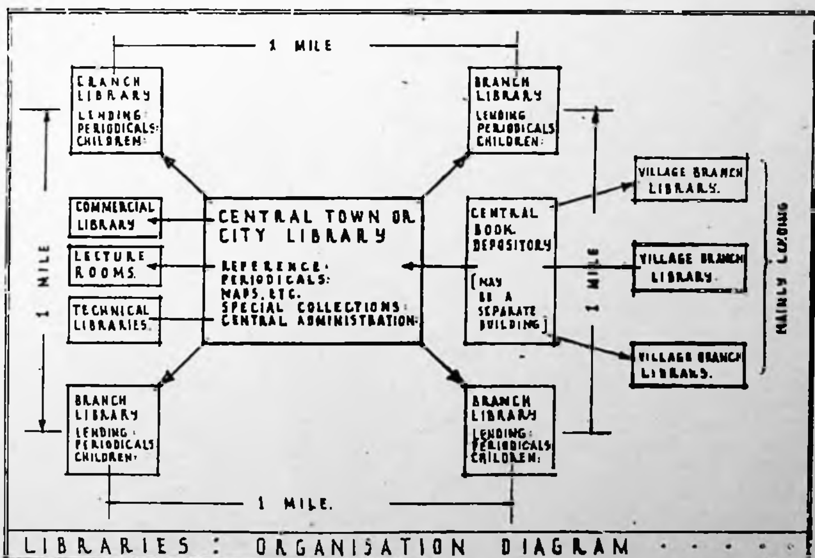


Figure 1

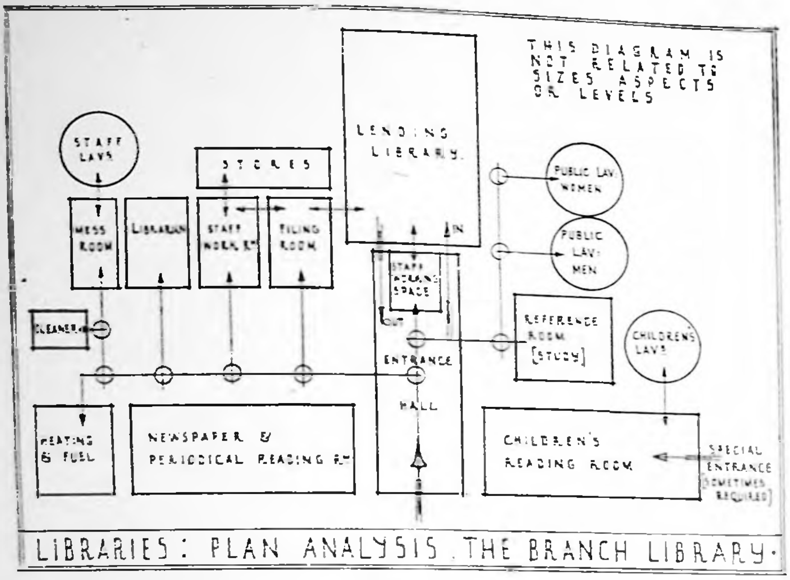


Figure 2

being placed as suggested on Figure 2 permits the attendant to control the entrance to the building and the doors to the public rooms. The planning of the lending library is dependent on the system adopted for the issuing of books, but for ordinary public libraries the open access system is being almost universally used, and therefore Figure 2 is based on this system. If a reference room is not provided at the branch library the few general reference books required are placed in one of the following positions: the periodical room, a study room, or in the staff enclosure controlling the lending library. The working rooms of the staff should not be easily accessible to the public, but easy access to any stack rooms is essential. The staff rooms generally needed are a librarian's private room, staff work room, cataloguing and filing room, cloakroom and a small mess room. Other rooms are needed for general storage, heating and for cleaners. Many public libraries do not seem to provide lavatories and W.C. accommodation for the use of the public, but such provision seems essential and it is desirable that separate accommodation be attached to children's rooms.

In some branch libraries provision is made for a resident caretaker who is given a flat either in the basement or on the first floor, but in the majority of branches such quarters are not provided. Cleaners' rooms are necessary on each floor level.

A very large number of branch libraries are single-story buildings with a basement occupying part or the whole of the area under the ground floor. A few, however, are planned as two-story buildings, especially when a lecture room forms part of the accommodation; this room is often placed on the first floor.

Disposition of Rooms—When a branch library is a two-storied building it is desirable that the children's rooms be on the ground floor level. It is more satisfactory to place the reading room and periodical room on the ground floor rather than on the first floor and the lending library on the upper floor if there is no space for it on the ground floor. Reference rooms, if provided, may also be on the upper level. It is wise, as a general rule, to lift the ground floor well above the surrounding ground level so that the basement may have good light and ample ventilation, especially if any work rooms or book storage are placed in the basement.

Entrance — The entrance to a branch library should be moderately spacious, but not so large that it encourages people to stand about. The space should provide for direct access to the several rooms adjoining. The main staircase, if there is an upper floor, should begin in view of the attendant in charge. Some wall-space is generally required for the display of notices and announcements and the boards for their display should form part of the general scheme of decoration. In many libraries in order to reduce the number of staff controlling the various rooms, the walls between the entrance hall and the rooms adjoining are formed with glazed screens, which should be more in the nature of large windows rather than complete screens in order to avoid an excessively "institutional" character. A proper vestibule or daylight lobby is essential at the entrance so that the main hall be neither cold, draughty nor dark for those waiting at the staff enclosure.

Periodical Room—In the majority of branch libraries the general reading and periodical rooms are combined, therefore the room has to provide accommodation at tables for general readers, for those reading magazines and standing accommodation for newspaper readers. In larger libraries the newspapers and other periodicals are sometimes placed in separate rooms.

Tables are generally planned to seat four, six or eight persons each. It is probably more satisfactory, if space permits, to use tables seating four persons only. These tables may either be designed to seat two persons on each of the two long sides or one on each side of a square table. Circular, hexagonal and octagonal-shaped tables are also used

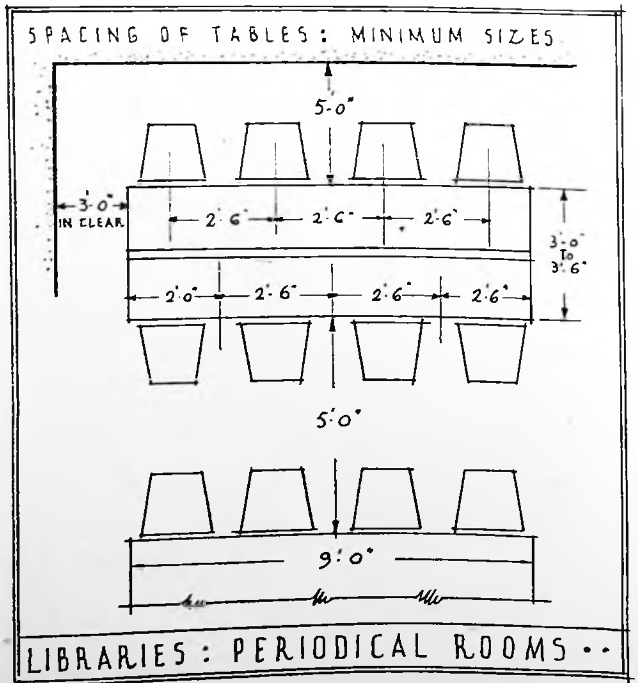


Figure 3

occasionally to break up the evenness of table-spacing in the room. Tables for periodical rooms often have a central rack or division with each reader's space marked for a particular paper which is usually fixed by some method to the table. Other libraries simply have flat or slightly sloping table tops and have the magazines kept in racks placed about the room or in fixed positions against the walls from which the reader takes the paper required, goes to a table and replaces the paper in the rack after use. Tables are frequently made rather too small for comfort; an allowance of 2 ft 6 in run of table per person should be used as a general basis, with a possible reduction to 2 ft for the places at table ends, as indicated in Figure 3. Tables are generally 3 ft wide, and

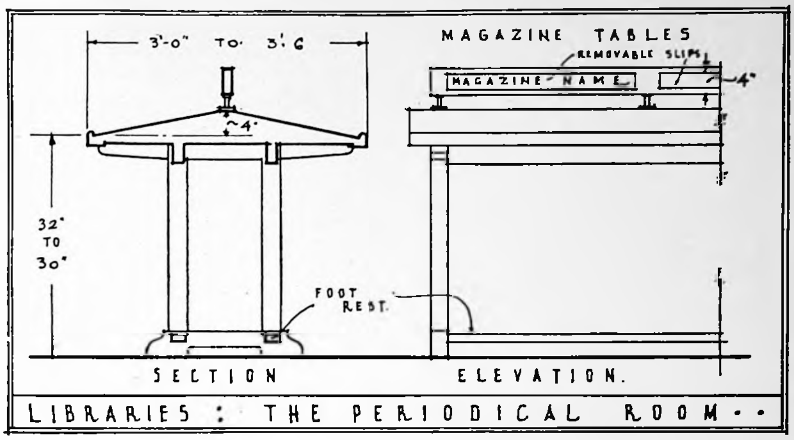


Figure 4

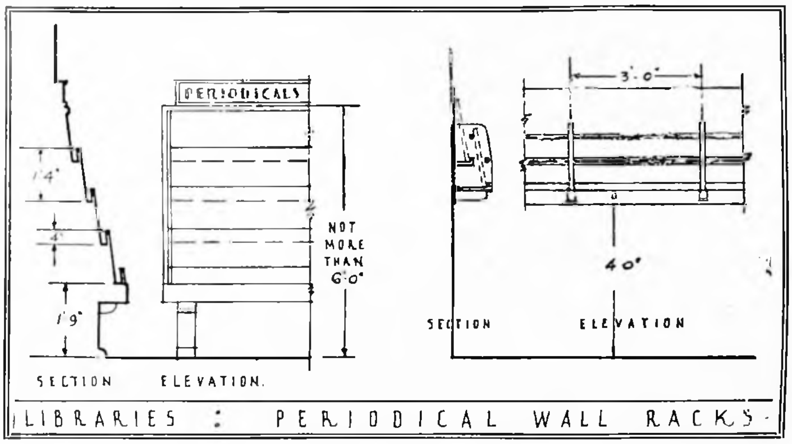


Figure 5

again, are better if slightly increased especially when there is a central division or rack. Figure 3 also indicates the minimum spacing of tables in relation to walls and other tables. At least 5 ft or, better, a minimum of 6 ft should be allowed between tables where there are movable chairs and between tables and walls where there are chairs at the side of the table or wall bookcases. When there are neither chairs nor bookcases between the walls and tables the passage way may be reduced to a minimum width of 3 ft. Tables are generally 30 to 32 in high above the floor level; tops may be flat or slightly sloping, as shown in Figure 4. The majority of users seem to like to have a foot rest, which incidentally strengthens the tables very considerably, but care must be taken to place the foot rails in comfortable positions for persons of average height. The name boards should be designed so that the name slips can be interchangeable behind glass fronts. The name boards also act as a screen and reduce the tendency to indulge in conversation across the tables.

The use of periodical racks against the walls or as independent fittings instead of the table racks is on the increase as more papers can be accommodated, and readers may sit where they wish. Periodical racks are of several kinds, but the most satisfactory types seem to be those which display the greater part of the face of the covers of each magazine rather than the vertical slot types in which only the backs of the covers are shown, making the titles rather difficult to read. This latter type, however, does accommodate a very large number of magazines in the minimum of space. In some libraries only single or double shelf racks are used, as shown in Figure 5. The lower shelf is placed about 4 ft 6 in above the floor, and the rack may be continuous for the whole length of the wall or walls on which it is placed as long as supports are placed at about 3 ft intervals. Solid shallow fronts or rails are necessary to hold the books in place. An alternative type is also shown on Figure 5, and is made in widths to suit the spacing of bays or piers between the windows of the building. If, however, the width is greater than 5 ft a centre division should be introduced to support the shelves and racks against which the magazines rest. The lowest shelf carrying the magazines should be at least 1 ft 9 in above the floor, and the overall height should not be more than 6 ft above the floor level. The shelves which carry the papers are placed behind one another and at a slightly lower level than the top of the support to the row in front. Thus an extra tier may be introduced in the normal height of the display surface. The spacing of the shelves may be varied considerably, but it must be remembered that some of the periodicals are quite large especially when enclosed in a stiff cover.

Chairs—Many types of chairs are used for libraries, but generally armchairs are to be preferred as they are more comfortable for readers and they also mark the spaces better. They are, however, more costly than small chairs. Many chairs specially made for library uses have rubber or leather pads or domes of silence on the legs to reduce noise. The design of the chairs makes a considerable difference to the general appearance of the rooms and very many libraries suffer in effect from poorly selected chairs. Ordinary movable chairs are to be preferred to the fixed varieties used in some libraries as each reader wishes to sit at a slightly different distance from the tables. Wooden chair seats are usual in periodical rooms to discourage "loafers," but they seem a disadvantage to the genuine user.

Newspaper Room—The display of daily and weekly newspapers is general in most branch libraries. The most satisfactory method of display seems to be upon wall stands rather than on island stands as supervision of the room by the staff is thus made easier and the room has a less crowded appearance. Smaller libraries often combine the newspapers with periodicals and by such arrangement the walls are devoted to the newspaper stands and all the centre part of the room to periodical reading tables. The stands are generally made with sloping faces projecting 15 to 18 in from the wall or from each side of the centre line of the stand. If the slope is too flat the upper portions of the pages are difficult to read. The stands are either designed of such a height that readers may sit while reading or

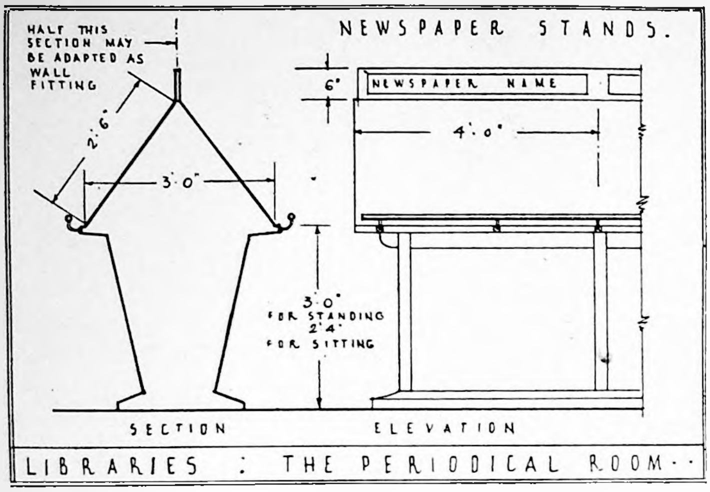


Figure 6

such that readers must stand. If readers have to stand it tends to eliminate "loafers," but is unsatisfactory for elderly readers. A few libraries have tried to design a movable stand which can be used for sitting or standing readers, but there does not appear to be a good solution to the problem. Figure 6 illustrates a typical newspaper stand, half of which may be used when adopted as a wall fitting. The general dimensions required are indicated on the figure. Each paper requires an area of about 4 ft in length and 2 ft 6 in. in height. The usual heights of the lower edge of the slope are 3 ft from the floor for standing readers and 2 ft 4 in for seated readers. A protection or leaning rail or bar of metal is sometimes fixed at the lower edge of the slope to prevent readers from leaning on and tearing the papers. The newspapers are fixed to the slopes by various patent locking bars. The titles of the papers should be displayed over each stand in lettering easily legible from all parts of the room.

Reference Books in Branch Libraries—The few general reference books which are required in a branch library are usually placed in a special bookcase in the reading room or occasionally in a case forming part of the staff working-space in order to check better the use of the books. Figure 7 illustrates a typical fitting for standing in a reading room. This fitting is 5 ft wide, which it may be considered wise to reduce a little or to add one intermediate support as the reference books may be heavy. The height is about 6 ft 6 in overall, exclusive of the capping, in order that all books may be within easy reach of all likely users. The depth of the upper shelves should be at least 8 in and by the adoption of the scheme shown on the figure for the lower shelves additional depth may be obtained, while at the same time the books are slightly tipped back so that the titles are more easily read. Frequently the lower shelf is placed about 1 ft 9 in above the floor level in order that readers should not have to bend down to read the titles or take out the books, but if space is limited to one small fitting of this type the full height is sometimes used as the books are only required occasionally. The shelves are all made adjustable by the use of one of the patent shelf supports. These fittings are generally made of wood as they are part of the general decoration of the reading room and are consequently in a similar material to the remainder of the furniture, although sometimes metal construction is used.

Ample space should be given round the reference case, and it is wise to plan a table or a wide shelf near it as some of the books, such as directories and dictionaries, are too heavy to hold with comfort.

Other equipment of periodical rooms consists of lists of papers taken and sundry notices for the information of visitors. Such lists and notices should have permanent positions in fixed frames incorporated in the general decorative scheme, but the frames to contain the slips or notices must be capable of rapid and easy changing.

Children's Department — It is desirable that separate accommodation should be provided for the use of children in branch libraries. This department should either have a separate entrance or access on one side of the main entrance hall. It is desirable to provide lavatory accommodation so that children may wash their hands and thus avoid excessive soiling of books. This lavatory should be near the entrance and in consequence near the staff desk. The ages of the children to be considered varies from about six to twelve or fourteen years, dependent on the age at which they are allowed into the adults' library. In view of the ages of the children all fittings and furniture must be designed in miniature to provide proper comfort. The full accommodation of a children's department should consist of a lending library, a reading room and study or talk corners where story telling and readings may take place. A staff desk is required in this department as the constant attention of at least one person is necessary during the hours it is in use. The staff desk does not need to be very elaborate, and it should not be in the nature of a rigid enclosure as the children require help and guidance in book selection from the shelves. The study or talks corner should open off the main room in the form of a large recess. Wall space is desirable for a blackboard, diagrams and pictures, while the furniture should consist of a number of chairs which can be grouped round a speaker in an informal manner. Some children's libraries do not have a lending section as home reading is dealt with through school libraries which may form part of the municipal or county library system.

Children's Reading Room—This is usually a large room with wall bookcases on two or three sides and one wall left for use as a lecture screen. The piers between windows or similar wall spaces are useful for the display of notices, pictures, etc. The centre part of the room should be devoted to tables and chairs. The tables are best if only seating four children. A suitable size is 30 in by 52 in, or 3 ft 6 in square, the former seating two children on each long side. Some circular tables are often used to vary the general appearance of the room and give an atmosphere completely different from that of the children's school rooms. Table tops should generally average 25½ in above the floor and chair seats 14½ in. The bookcases should be against walls so that supervision is made easy and children cannot hide behind projecting or island cases. Cases should not exceed 5 ft 6 in to the centre of the topmost shelf containing books. Figure 8 illustrates the furniture dimensions suggested and also the relation of table positions to the surrounding walls and to each other. Ample space is needed between the tables and wall book shelves because the children often stand for a long time considering what books they will take out.

Lending Department—The lending library is generally the most important section of a branch library. It may be a self-contained unit or may be fed from the parent central library and its stack rooms. The lending department planning is largely dependent on the adoption of "open" or "closed" access. The latter system is now little used in new ordinary branch libraries and is, in fact, rapidly being replaced by the "open access" system which is certainly general for all new schemes.

The difference in the systems alters planning considerably, as, if the public are to have access to the shel-

ving, more space is required between shelving. Also a lay-out of bookcases is needed that permits of constant supervision by the staff from the working spaces provided for it.

The "closed access" system required a much larger public counter space where books were handed in and issued and also for book "in" and "out" indicators; though, on the other hand, the actual shelving was arranged much closer together, no stack room lines, (*vide infra*), as the staff only have access thereto.

Figure 9 shows in diagrammatic form the essential circulations required for an open access lending library. The reader approaches the book room from the entrance hall by passing on one side of the staff enclosure where returned books, and fines, etc., are

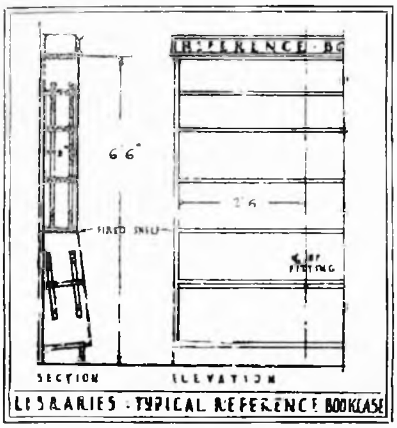


Figure 7

dealt with. At the end of the staff enclosure or in a separate fitting are placed the catalogues for reference. The reader then circulates around the bookcases and selects the books required and passes out on the opposite side of the staff enclosure where the borrowed books are checked and readers' cards reissued. The bookcases are frequently arranged (as shown on the figure) radiating from the staff enclosure in order that all

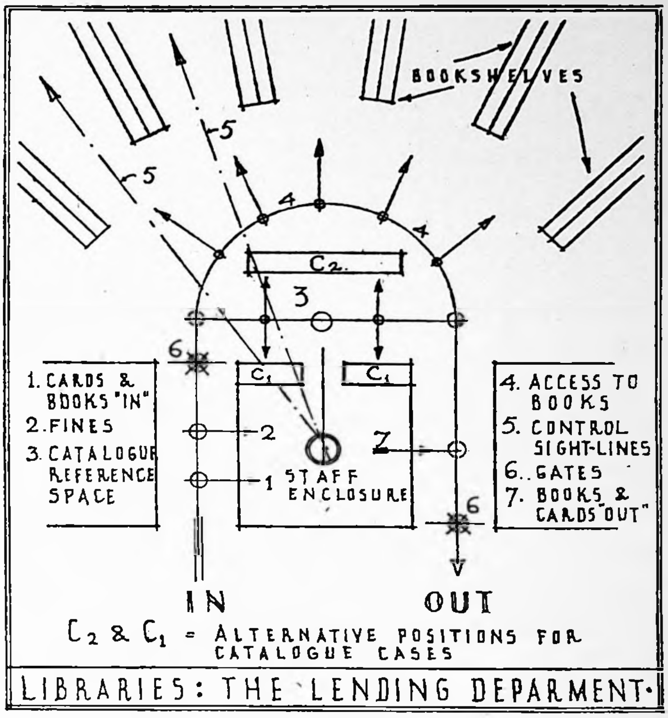


Figure 9

shelves and the spaces between them may be under supervision by the staff on duty in the control enclosure. This radiating lay-out is uneconomical in space, but reduces the cost of supervision. In large schemes extra bookcases may be introduced as the distance from the staff enclosure increases, but at least 6 ft width of gangway is needed between them. The bookcases may be placed only 3 ft apart in closed access libraries where the public do not circulate among the book stacks and the radiating lay-out becomes unnecessary.

The area of a lending library may be roughly based on an allowance of 20 sq. ft. per person of the maximum number likely to be present at any one time, inclusive of gangways and book stacks.

It is essential that the lending library should have very good lighting in every part of the room, so that visitors may read easily the titles on the books in the shelves. These rooms are generally of fairly large dimensions and rather square in shape, and therefore top-lighting often provides the most satisfactory solution, especially as there may be wall cases which would be below windows and therefore overshadowed. In addition, there may be island cases which materially obstruct side-lighting, if the latter only is available.

It is an advantage to have easy access from the lending library to the library work rooms where ingoing and outgoing books from and to the central library and repair rooms are handled.

The book stacks are either made of metal or wood or a combination of the two. Metal shelving is becoming more general for stack room purposes, although some library committees prefer the appearance of wood in rooms used by the public.

Shelving in lending libraries is generally based on an allowance of nine volumes per foot run, and on the assumption of an average of eight shelves in the usual height of 7 ft 6 in. In some branch libraries, which are fed from a central library or stack room, it has been found that sufficient shelving can be obtained by the use of the walls only, without island bookcases. If wall cases only are used, the floor area of the room may be used for display tables, where special volumes, such as new books or works on special subjects, may be shown. It is not general to provide

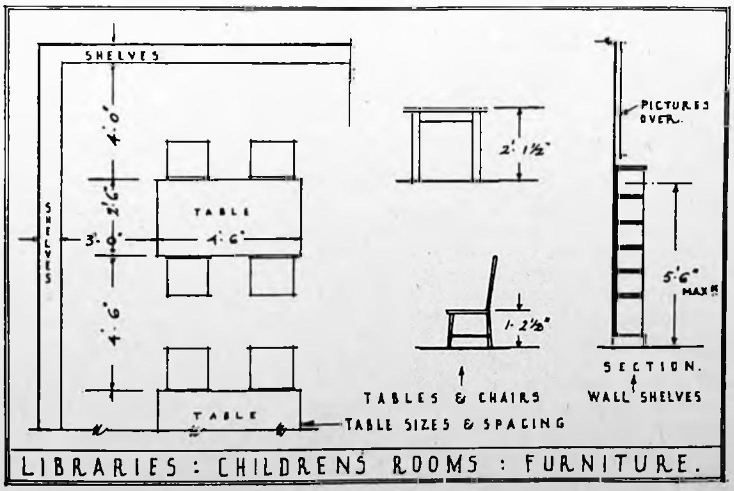


Figure 8

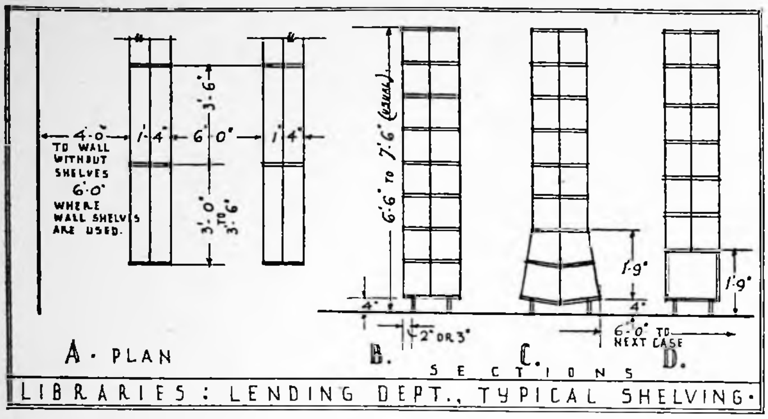


Figure 10

on the anticipated number of users of the library at any one time and, therefore, the number of staff that will be required to work within it at any one time. In small branch libraries one person can control both incoming and outgoing readers, but in larger libraries at least two members of the staff are needed within the same enclosure and often more in very busy branches. The staff enclosure may be arranged in a variety of ways depending largely on the number of staff to be accommodated. It is usual to let the public pass on each side of the enclosure, but in some large libraries the two public ways are placed together, with the staff desks on each side. Alternatively, the entrance and exit desks and passage ways are quite

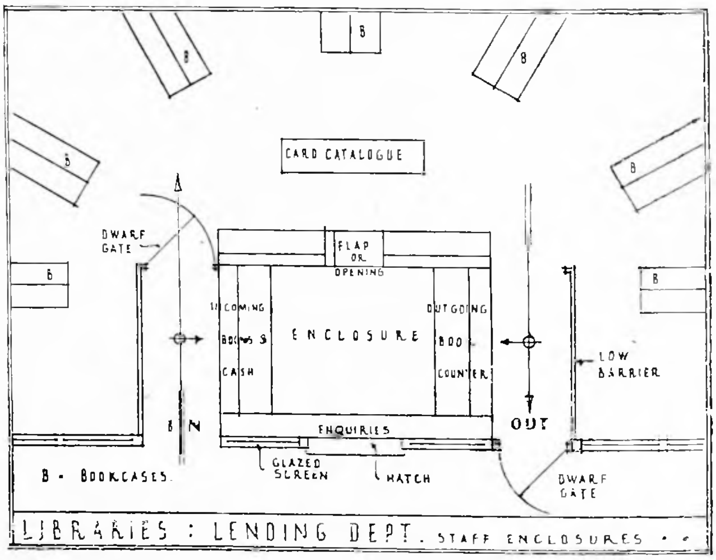


Figure 11

any tables, chairs or other facilities for reading in the lending library, as they occupy gangway space and are little used. Some libraries have limited the height of bookcases to 6 ft 6 in, which is considered by some to be as high as the average person can reach or read the titles of the books. Also in many schemes the lowest shelf is placed about 18 to 21 in above the floor, as readers stooping to see the books on the lower shelves may often obstruct the gangway space. Some libraries have the two lowest shelves slightly tipped outwards to facilitate reading of lower book titles. As fiction accounts for some 65 per cent of the books in the average lending library, these are frequently arranged horizontally on the more central shelves of the bookcases.

When island bookcases are used either with or without wall shelving, display cases, book troughs or shelves for new or special books should be planned in a prominent position in the room, either against the walls or as island fixtures.

Figure 10 illustrates three typical sections through lending library bookcases and a plan showing the main dimensions in relation to the surrounding walls or bookcases. Island cases must be at least 6 ft apart. Four feet should be allowed between walls without bookcases and island bookcases, but this dimension should be increased to 6 ft if there are wall bookcases. A depth of 8 in should be allowed for all shelves for normal use, but some shelving having a depth of 10 in is generally necessary in some part of the library, and may very well be provided in cases placed against the walls. The larger books can also be accommodated in the lower shelves where Type C in Figure 10 is adopted. The type shown in Diagram D has the lowest shelf placed 1 ft 9 in from the floor for reasons discussed above. The length of shelves should be in units of 3 ft or 3 ft 6 in between vertical supports, which is the greatest length of shelf which should be used to guard against excessive sagging of the shelves under the weight of books, unless very thick wooden, or reinforced metal, shelves are used. Occasionally, however, shelves are extended to a maximum length of 5 ft between supports. All shelves are generally made adjustable in height between the supports, although in a lending library this does not seem entirely necessary as allowance can be made for the few specially large books which have to be accommodated and a part of the shelving only has, therefore, to be adjustable.

The passage ways through which the public pass in and out are generally only made sufficiently wide for one person to pass through at one time. Some libraries control the passage with a turnstile or wicket gate, but others consider such control unnecessary. Wicket gates should be of self-closing type with a check to prevent noisy slamming and with stops to prevent opening in the wrong direction.

Staff Enclosure—The lay-out of the lending library centres round the staff enclosure from which the whole of the activities of the department are controlled. The size of the staff enclosure is entirely dependent

separate in different parts of the room, though this lay-out is seldom adopted as communication between members of the staff is made somewhat inconvenient. The access ways for the borrowers should be about 2 ft 6 in wide between the barriers. Figure 11 illustrates a typical lay-out of a staff enclosure with the passage ways on each side. This enclosure is placed at the entrance to the room and it is consequently necessary to have sufficient space in the main entrance hall or vestibule for borrowers to form a queue during busy periods.

Figure 12 illustrates a similar lay-out, but the staff enclosure is placed almost centrally in the library and therefore the bookcases are slightly rearranged on a star-shaped plan. This system places the staff in a better position in relation to the book stacks and for central control and is, in addition, less draughty. Barriers are needed in the room to divide the passage ways from the library itself, but these form convenient waiting spaces in front of the staff desk. The placing of the staff enclosure in this situation does, however, interrupt the

easy circulation of borrowers passing from the front bookshelves on one side of the room to those in a similar position on the other side. Also, if visitors making inquiries have to go to the staff enclosure in the type shown in Figure 11, they do not have to enter the library proper as an inquiry hatch or counter may be arranged directly into the hall. In the type shown by Figure 12, however, inquirers have to mix with the queue of book borrowers, with a risk of some confusion during busy periods.

Figure 13 illustrates the divided staff enclosure type of lay-out with the passage ways for borrowers placed centrally and together. This system is not frequently used and is only suitable for very large libraries, as in smaller branches the more limited staff requires the easiest facilities for communicating between the incoming and outgoing sides.

The general lay-out of the staff enclosure has been fairly well standardised and varies chiefly in accordance with the number of staff to be accommodated. The end of the enclosure facing the entrance is generally used for inquiries, voucher cards, readers' tickets, register of borrowers, etc., special shaped drawers or receptacles being provided for each purpose in order that everything required by the staff is readily available with the minimum loss of time. The counter on the "in" side has to provide spaces for the "charging" trays which are sometimes sunk in the counter-top with a slide to cover them when not in use, or else the trays are arranged as drawers and placed on the counter when required for use. The bottoms of the trays are often sloped in order that the cards at the back of the trays are more easily readable. A drawer is generally provided for cash with the usual "till" bowls for cash and divisions for notes, etc.; this drawer is generally placed in the centre of the fitting with a kneehole space below it so that the member of the staff may be comfortably seated. It is usual to make the whole of the counter-top (at writing table height-level) clear, and therefore available for the "charging" trays. The whole of the fitting below this counter-top is fitted with shelving or bins to provide temporary accommodation for the returned books until they can be replaced on the library shelves. These bins or shelves are often arranged so that the books may be roughly classified as an aid to the rapid replacement in their proper places. The wicket gates, when used for controlling borrowers passing the staff enclosure, are frequently operated by a push-bar placed at the top edge of the counter or alternatively with a foot-treadle similar to that used for a turnstile. If operated by the push-bar, the assistant in charge may press any part of the bar and does not have to reach for a single knob or push-button. The end of the enclosure opposite that used for inquiries is usually left open for staff access to the library or it may be closed with a flap counter-top.

The counter on the "exit" side is somewhat similar to that on the "entrance" side, excepting that the shelving is used for other purposes, such as stationery storage, bins for books withdrawn for repairs. It is usual to have a piece of plate glass on the counter or an entire glass-covered counter-top to prevent staining by dating stamps. The issue trays may again be placed on the counter-top or sunk into it.

The area required for the staff enclosure must depend on the anticipated number of borrowers. In very

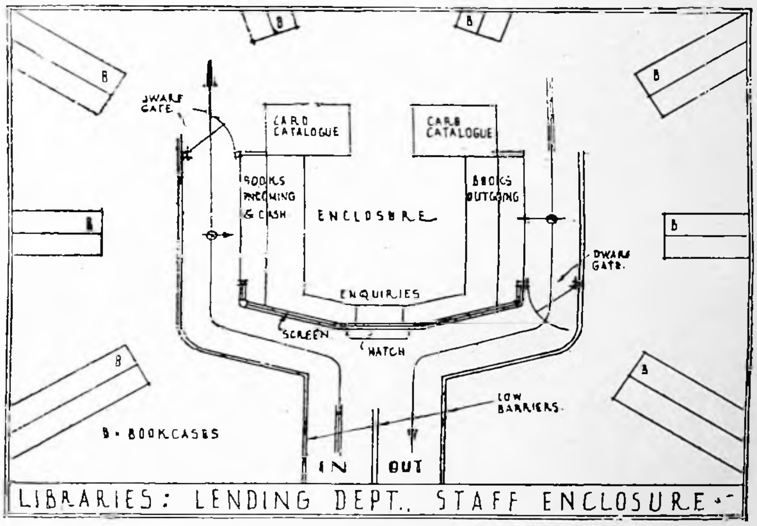


Figure 12

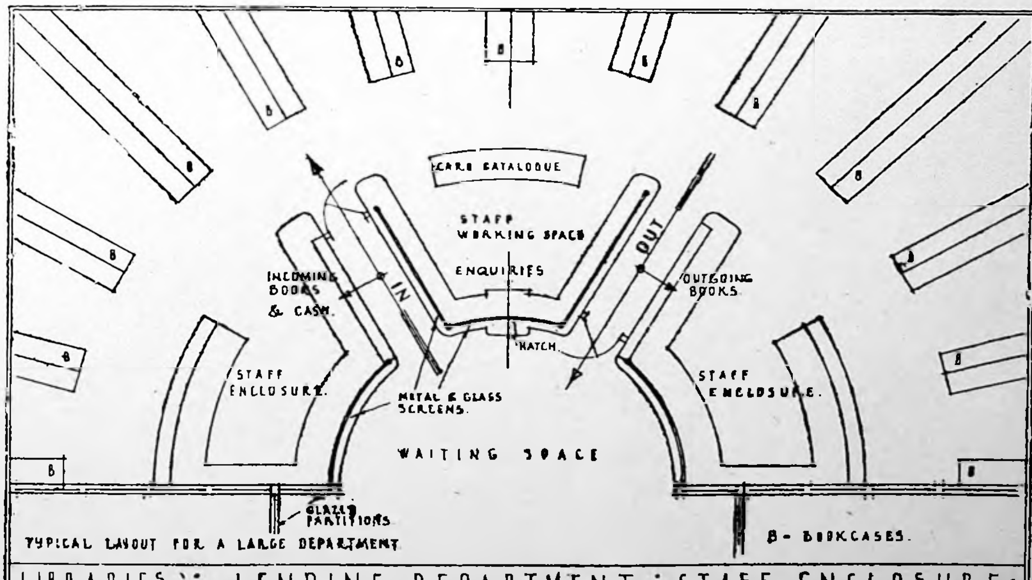


Figure 13

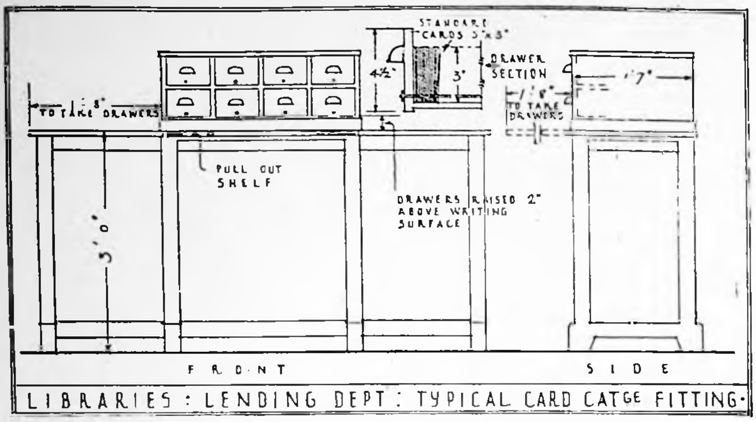


Figure 14

small schemes one assistant may be able to control both "in" and "out" borrowers by having a narrow enclosure, both counters of which are within reach by making a half-turn on a swivel chair; the total space required for such an enclosure would be about 7 ft wide and a similar length. Counters are normally about 2 ft wide and at least 5 ft 6 in apart, if two persons are to work back to back. Counters are usually 3 ft or 3 ft 3 in high with the back or screen raised a further 9 to 12 in, at which level a shelf for the use of borrowers is placed. This shelf should be about 6 in wide. An average overall length of the enclosure for a busy library is about 10 ft.

These staff enclosures have become standardised by several makers specialising in equipment for use in the ordinary branch library, although many librarians prefer to have specially designed fittings to suit their own particular methods and theories of the handling of the book delivery system. Although the arrangement and lay-out of the "contents" of the fittings are standardised in size and shape, there is no reason why their general appearance should not be changed to suit variations in general design of, and to be in harmony with, the room. There seems to be a tendency to accept the standardised designs and materials, which are not always suitable in all cases, whereas better design, workmanship and materials would not add greatly to the cost and might even better withstand wear and tear, in addition to making for the more attractive appearance of many libraries. This point may receive particular stress by a detailed examination of some of the better public and institutional libraries. To eliminate to some extent the discomfort of draughts due to placing of the staff enclosure and at the same time to permit of supervision, the staff enclosure is surrounded by glazed partitions about 7 ft high. However, in the majority of more recent schemes, by the planning of proper cut-off lobbies at the main entrances and by the general and well-planned use of central heating, these screens have mainly been rendered unnecessary.

Card Catalogue—The smooth working of the lending library is greatly dependent on the efficient cataloguing of the books and also on some form of guide to the position of the books in the shelves.

The catalogue generally takes the form of a card index system using a card 5 in wide by 3 in high. The advantage of the card system is its unlimited means of expansion and interchangeability, thus permitting perpetual alphabetical order. The cards are held into the trays by rods passing through slots in the lower edge and screwed or locked into the drawer fronts. The card drawers or trays should be placed at a convenient height for handling by the reader of average height when standing and should therefore not be placed in too many tiers, as the use of one drawer in a tier prevents the use of the lower ones by other persons. It is advisable for drawers to be removable so that the maximum number of persons may consult the catalogue at one time and for that purpose slides are indicated in the front of the fitting shown in Figure 14 and a shelf is provided on each side. Writing space is needed on which application forms may be filled in. If the slides and side shelves are not provided, tables should be placed adjoining the card catalogue. Figure 14 shows the main requirements of the card catalogue fitting; it may be extended to suit the needs of the particular library, although it is unwise to have too many drawers together for reasons previously given. Some card catalogue drawers are placed on bases resembling ordinary tables of the same width as the card drawers and having sufficient clear space in front to stand the drawers on when removed from the cabinet.

Plan Display Tables—Many libraries use a plan display table to indicate to users the general placing of subjects in the shelves. This fitting sometimes consists of a plan on a table with a slightly sloping top to make it more easily legible; the drawing is usually covered with glass. Other libraries incorporate in the fitting the subject index by placing reading slopes on one or both sides of the table top, to which the subject index is attached. This drawing should be placed 3 ft above the floor as it is consulted when standing, as is also the subject index. It is essential that the card catalogue fittings and the plan display cards have ample clear space surrounding them and also good light both natural and artificial.

Work Rooms—The amount of working space required for staff use varies very much, as in some systems the branch library is self-contained and in others the majority of the work is done at the central library. The chief librarian is usually given a private office adjoining the public rooms and it is desirable to provide at least one general work room for cataloguing new books, dealing with books arriving from and returning to the central library. If there are several members of the staff, a common room is desirable, together with cloakrooms and lavatories for each sex. A cleaners' store, boiler-room and fuel stores may be placed in the basement.

Lecture Rooms—Many branch libraries now have a lecture room attached; this may conveniently be placed on an upper floor but should be approached from the main entrance hall so that the normal public rooms of the library are not disturbed or may be locked up without disturbing the general circulation of the plan.

The seating that is normally used for public halls is usually adopted for these lecture halls. Sloping floors are seldom used, although their introduction is a great asset for purely lecture purposes, they prevent the use of the room for special displays of pictures, local exhibitions, etc. Provision for the use of a cinematograph and lantern should be made. This involves the special planning required for the projection box under the Cinematograph Act and the various regulations issued thereunder as previously described in other sections. The matter of seating is fully discussed in the sections on "Municipal Buildings" and on "Community Centres." The planning is, so far as seating, exits and staircases are concerned, the same as are required for all places of public entertainment. In the design of a lecture room provision should be made for a blackboard, a projection screen and a proper platform. There should be a proper communication system between the platform and the projection box and a screened reading light. In some library lecture rooms provision has been made for technical demonstrations which need supplies of gas, electricity and water. Occasionally the platform is made sufficiently

large for small musical performances such as concerts of chamber music and often, it may be, for play-readings. It is not usual to provide any elaborate stage equipment but a system of curtains is sometimes installed. At least one retiring room and preferably two, each with lavatory accommodation, is needed in connection with the platform.

CENTRAL LIBRARIES

General — The central library may serve chiefly as the reference library, together with its stack rooms; as a lending library it may serve the part of the town in which it is situated, if the needs of the population demand book exchange in that area; also it may serve as the central depôt from which the branch libraries are supplied. The latter department may be separated in a building on the outskirts of the town where land values are less costly.

The main room of the central library is the general reference library to which are attached large stacks for its service. Special collections belonging to the town are generally housed at the central library, as well as collections of local material, maps, music, manuscripts and rare book rooms, commercial and technical libraries. Provision generally has to be made for newspapers, periodical reading rooms, as well as stack rooms for the storage of back numbers of newspapers and periodicals. A lecture room is a necessity. Large staff accommodation is required for the administration of the whole library system, as well as work rooms for the staff at the central library itself. Rooms are needed for such activities as binding, cataloguing, book purchase, filing and records, as well as offices for the administrative staff, and a committee room. Figure 15 illustrates diagrammatically the essential relationships of the various rooms of the central library and the main circulations required. The reference room should be the main focal point of the scheme, but the various subsidiary libraries should be capable of approach without passing through the main reference library. The general inquiry desk should control all persons entering the public parts of the building. The main catalogue which requires a large area should be readily accessible to all the users of the reference room. The public do not enter the stack rooms of the reference libraries. The periodical and children's reading rooms should be approached from the main entrance near the doors, or by separate entrances, in order to prevent the disturbance of the reference library. Lavatories should be provided for the general public, for children near the children's room and for the staff near their mess or common room. The lavatories for the general public should be placed so as to be easily available to the lecture rooms. Living quarters for a residential caretaker are often provided, either on an upper floor or in the basement, although the latter is more useful for book storage, being nearer the library and also more convenient for structural reasons, in view of the heavy loads to be supported.

The Reference Room—The reference room is generally of large dimensions. It is sometimes used partly for book storage, but in some libraries no shelves whatever are placed in the room. The majority of libraries, however, rely to some extent on open access to a portion of the collection of books and therefore these may well be placed in the reading room itself. Some libraries depend on open access throughout except for a limited part of their stock consisting of the more valuable possessions; in such libraries the walls are lined with shelves, and cases projecting into the room forming alcoves are often adopted. The reference library is essentially a place for study and therefore the alcove system is ideal except in libraries where there is a considerable amount of rapid reference, when the large open room is perhaps better. A combination of the two types may be regarded as the most satisfactory layout of all, as it provides facilities both for the student reading at length in the alcoves and the reader making quick references in the main room.

Control by a member of the staff to check readers' cards, etc., is required at the entrance to the reference room, but the main control of the room is from the book-issuing desk. With the alcove system it is difficult or impossible to plan the staff desk to have visual control of the whole room.

The public are seldom permitted to enter the stack rooms; so that, if open access is required to any large extent, the shelving must be placed in the reading room itself. If the public had access to the stack rooms, much more generous spacing of stacks would be necessary than that usually adopted. The ease of access for the staff from the stack rooms to the reading room is the most important factor of the plan in order that the minimum time is taken to obtain any book wanted. The lay-out of the room depends on table spacing, which in its turn is dependent on the number of persons seated at each table. It is now becoming general for these tables to seat four persons, two on each side, but it is better to have tables seating two persons only, one on each side, to give greater privacy. The older libraries use long tables seating eight or ten readers on each side, with a central screen dividing the readers on either side and sometimes low screens or divisions between each reader. The latter divisions give some privacy and ensure to each reader a fixed amount of table space. It is usual to allow about 6 sq. ft. of table space per reader and a slight increase in area is advantageous to students who may require to refer to several books at one time, in addition to writing-space, ink-well, pen-tray, etc. Figure 16 illustrates the general spacing of tables needed to give adequate circulation between the tables. It must be borne in mind that there is continual passing and repassing of readers and staff carrying books, which must not disturb other readers, therefore plenty of space is required. The main gangways should be 6 ft wide at least and subsidiary gangways should be 3 ft wide; but if they are against the walls of rooms they should be increased to four feet when there are bookcases against the walls.

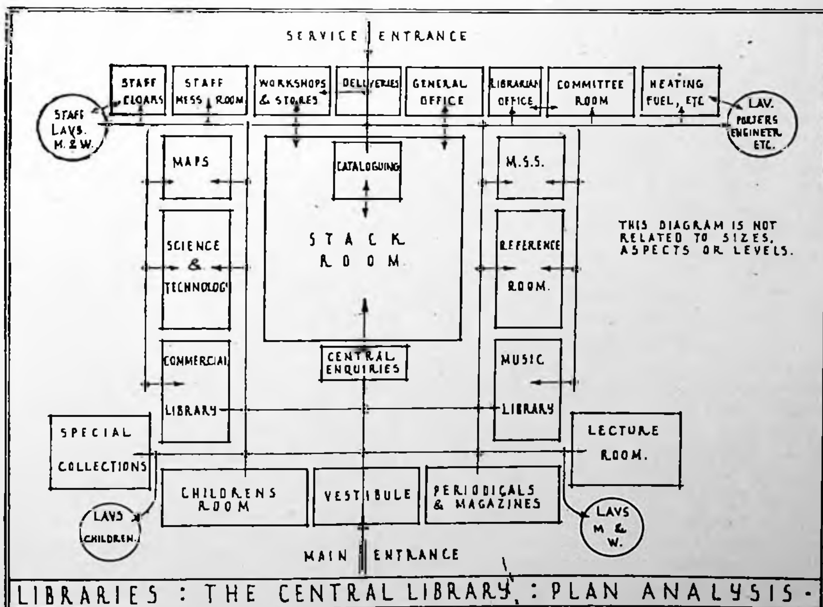


Figure 15

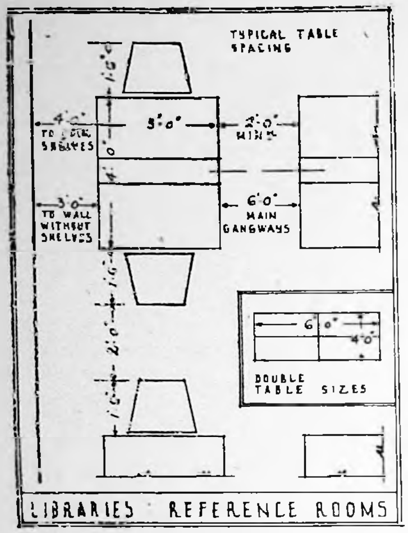


Figure 16

The space between the sides of tables, although frequently only a few inches, should be at least 2 ft, and between the writing sides of tables at least 5 ft, which only leaves about 2 ft between chairs, and should, if possible, be increased.

When dual tables are used the spacing between tables should remain the same and therefore there is a saving in the floor area necessary. Tables are generally 6 ft long for two readers on each side and 3 ft for one reader, with a width of 4 ft for double-sided tables. The width is sometimes reduced to about 3 ft, but a writing surface of 1 ft 6 in is not sufficient for study purposes.

Figure 17 illustrates the main spacing required for the alcove type of table spacing. This lay-out is based on a bay spacing of 12 ft 4 in, although this minimum is slightly variable, depending upon the material of the shelving and also the depth of the shelving. The latter may be made for the usual 8 in depth, or may be increased for part or the whole height to accommodate larger volumes. The clear space needed between the vertical faces of the shelving is 11 ft to accommodate double-sided writing tables with the necessary chairs. The length of the alcove from the outside wall is governed by the width required for a gangway between the wall and the table and the number of readers' spaces provided. The readers' spaces should be based on an allowance of 3 ft per person, although this is often reduced to 2 ft 6 in. The gangway between the table and the outside wall should be at least 2 ft wide if the wall is not used for bookcases; but this should be increased, if possible, when there are bookshelves. The tables are generally designed to seat four or six persons. If they are larger, supervision becomes more difficult and also the general area of the reference room is likely to be too large, especially if other tables are placed in the centre or main part of the room and allowance is made in addition for a main gangway at least 6 ft wide and preferably much more.

Figure 18 shows the essential dimensions of a reference room table for two persons, one on each side. The table is 3 ft wide and 4 ft across, allowing for a central division or screen between the two readers, which also serves to lean open books against for reference. The tops are sometimes made sloping but are more usually flat. An ink-well is generally provided either in the top of the table or on a shelf on the central division. It is an advantage to have a shelf under the table-top on which to place extra books, a writing case, or an overcoat. A slide at the writer's left hand is very useful as extra table space. Comfortable chairs should be provided, a fact often overlooked in libraries, as readers may be working in the library for a whole day or from day to day for several weeks.

Figure 19 shows a more elaborate type of reference reader's table for four persons, two on each side. The table area allotted to each reader is slightly larger than that shown in Figure 18, and in addition this type has the advantages of a division incorporating the desk lighting, the top cover of which also serves as a book rest. Lights are so placed that they give an intense light on the writing surface without shining into the reader's eyes while the general lighting of the room is sufficient for the lighting of the upper slope where books not actually in use are placed. The essential factors of the design of reference tables are to provide large areas for placing the books required, which are often very numerous and in all cases the provision of good light on the reading and writing surfaces.

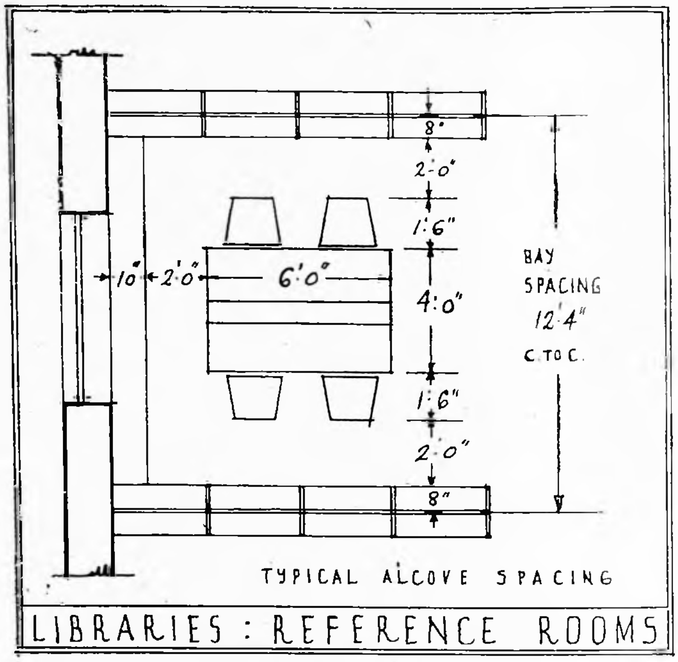


Figure 17

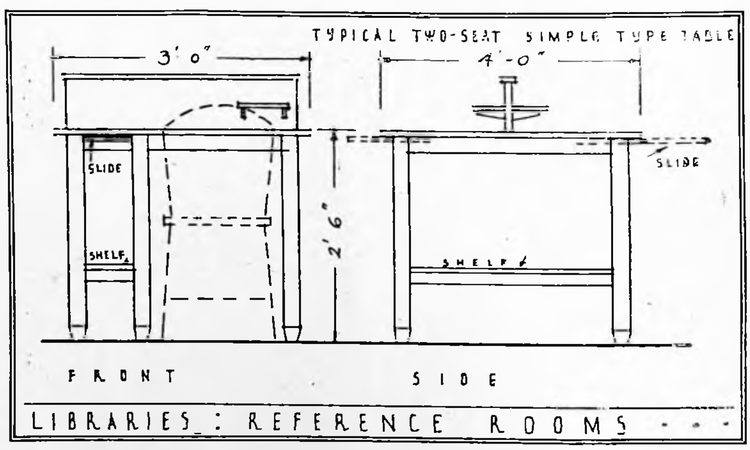


Figure 18

Stack Rooms—Stack rooms must be placed so that very rapid communication is easily maintained between the reference library staff and any book in the library stock.

The best position for a stack room appears to be immediately adjoining the reference room and at the same level, with "in-and-out" circulation by separate doors to avoid members of the staff or book trolleys having to pass one another in doorways. However, in most central libraries or important reference libraries sufficient storage space on one floor is found to be impossible and therefore a system of a rapid and adequate lift service is essential between storage levels and the reading room. The lifts are operated either electrically or by hand, according to the height to be travelled and the anticipated time to be allowed for the handling of books; small cars are generally used, having a clear area of about 16 in by 20 in, but it is an advantage to be able to use some or all of the lifts to transport loaded book trolleys; the size must then be increased to 36 in by 20 in. For important reference libraries with large seating capacity, several book lifts are essential.

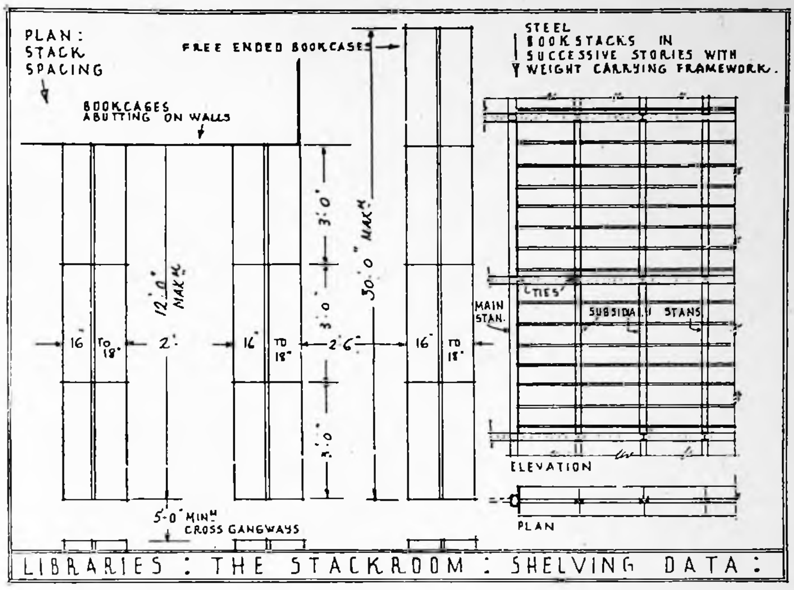


Figure 20

Book Stacks—It is the general practice to use stacks which are approximately 7 ft 6 in high; this permits access to all books by persons of average height without steps or ladders. The stacks are superimposed one on another, with a light flooring of stone, marble, glass or steel at each 7 ft 6 in of height. The stacks for storage purposes are generally of metal construction. Shelves are generally 7 or 8 in wide, requiring an overall projection of about $9\frac{1}{2}$ in from the wall for wall shelving and an overall width of $16\frac{1}{2}$ in to 18 in for double-faced island stacks; it is necessary to provide for ventilation between two stacks of books placed back to back. The usual shelf length is 36 in, and stacks are therefore made up as multiples of this dimension. Many libraries are now finding that it is desirable to use shelving of greater depth in order to accommodate books needing a shelf depth of more than 7 in or 8 in. in any part of the shelving. For this purpose a 10 in shelf is generally sufficient. Large volumes such as folio and large quarto sizes should have special accommodation. All shelves should be adjustable. Most book stacks are normally designed for 7 in shelves but oversize shelves up to 10 in can usually be used in the same standards. Some stacks having approximately 12 in shelves are usually provided, giving 24 in overall width double-faced island cases. A wire mesh division is usually placed between back to back bookcases to allow air circulation and to prevent books being pushed back into the wrong shelves.

Space Required for Books—Seven rows of books can usually be placed in the standard height of 7 ft 6 in, and the following table is of a general guide to the average number of volumes per foot run of shelving for different classes of books:—

Class of book	*Vols per ft run of shelf*
Bound periodicals ...	$5\frac{1}{2}$
Fiction	9
General literature ...	8
History	8
Law	6
Medical	$6\frac{1}{2}$
Technical	7

Bound periodicals mostly require shelves at least 10 or 12 in wide and some of them a little more. Many medical, technical and scientific books also need wide shelves. From the above table it may be assumed that the volumes in a lending library average 9 per foot run and in a reference library only 8 or slightly less; thus, a standard tier of shelves 7 ft 6 in high and 3 ft wide, when double-sided, will contain about 430 volumes in a lending library and 380 in a reference library.

In stack rooms to which the public does not have access, the stacks may be up to 30 ft in length if there is access at both ends; but 18 ft lengths seem to be generally used. If access is available at one end only, 12 ft should be the maximum length of aisles.

Double cases should be 3 ft apart, although sometimes this dimension is reduced to 2 ft 6 in, which is the absolute minimum in which a book trolley may be used with comfort. If the aisles are to be used for working purposes their width should be increased to 6 or 7 ft. It is general to assume that stacks of books give the following weights when structural loading calculations are made. Books weigh about 16 lb per lineal foot of 7 in shelf and metal stacks about 5 lb per cu. ft. of erected stack. The general loading for 7 ft 6 in high

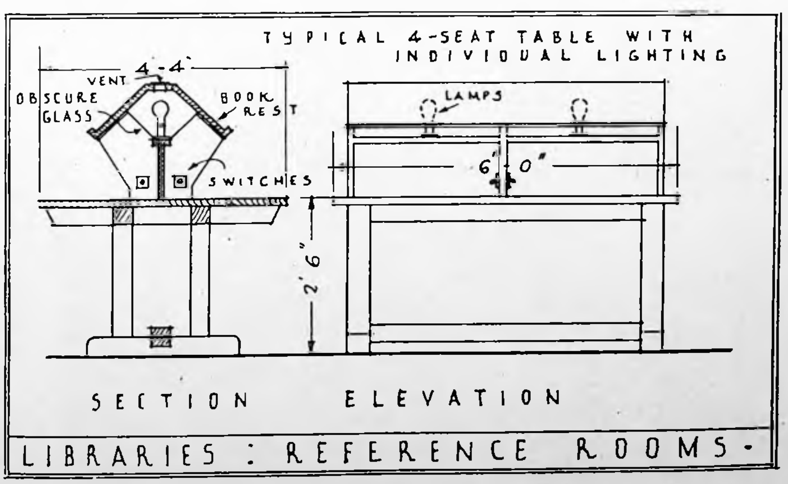


Figure 19

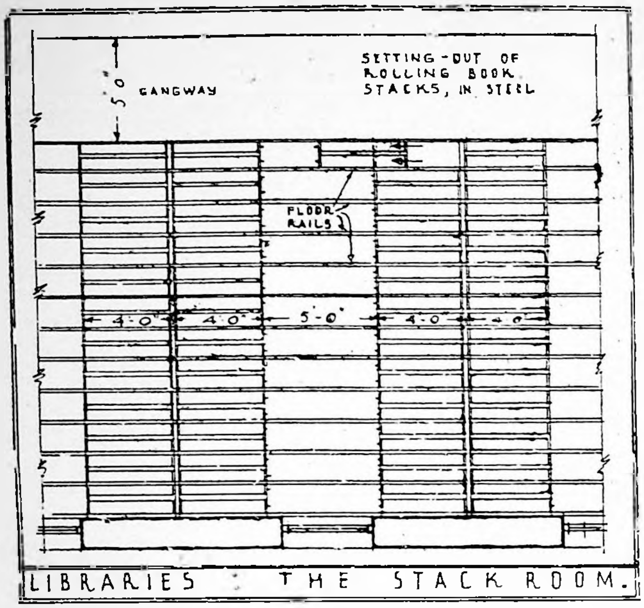


Figure 21

stacks should be assumed as 1½ cwt per sq. ft. (Figure 20).

Staircases leading from one stack level to another should have a width of at least 30 in, or, if spirally constructed, a well of 4 ft 3 in overall diameter.

Floors to the various levels of the stacks can generally be accommodated in an overall depth of 4½ in. Provision must be made for continuous ventilation and movement of air to all parts of the stack room and also for the circulation of heat. The relative merits of the various materials for the intermediate decks in stack rooms are not easily assessed. The most satisfactory appears to be rubber or cork on a thin concrete slab. White marble seems to be one of the most generally used, but it is difficult to clean, and expensive, but reflects light better than most other materials. Thick glass is slippery and therefore dangerous, also noisy, but it does transmit some light from one level to another. Cast iron is cheap but very noisy. Slate is cheap, not so noisy as cast iron, but difficult to clean and does not reflect light. Wood is in many other respects the most satisfactory, but dangerous in case of fire.

The stack room must have adequate artificial light for working purposes and it is usual to have lamps in the narrower aisles about 6 ft apart and in wider aisles 12 ft apart. The lights are controlled by local switches near each set of cases.

Rolling Book Stacks—A desire to economise floor space has sometimes resulted in the mounting of each length of stack on rollers, on which it is moved into the gangway between the cases. By this method the stacks are placed against one another so that one gangway about 5 ft wide serves two rows of stacks, each 4 ft wide and 18 ft long, as shown in Figure 21.

Much space is saved but it is probable that the system is a little slower in operation.

Special Shelving—Most libraries need suitable storage for bound newspapers, extra large folios, prints and maps. The smaller libraries only need to provide for a small number of such shelves, but the problem becomes very difficult in large and important libraries.

Racks for newspapers are frequently formed of fixed shelving to give spaces 3 ft wide, 3 ft high and 3 ft deep, in which the filed papers are placed in fairly considerable numbers as frequent reference to them is unusual.

Large folio volumes generally need to be kept flat as the leaves and bindings suffer damage if they are placed vertically. The shelves on which they are placed should draw out. The dimensions of the cases vary considerably in size but a good general rule is to space the vertical divisions 3 ft apart and use seven shelves in a height of 4 ft; the depth needed is from 2 ft 6 in to 3 ft. It is general not to make these fittings very high in order to provide a reading slope on the top of the fitting at about 4 ft above the floor level.

Galleries—Many reference rooms have one or more galleries round the outside of the room in order that the upper wall spaces should not be wasted for book storage. This is often an essential economy of space where the reference room is of great height owing to its large area. The lowest gallery should be placed at such a level as to leave at least 8 ft clear between the floor and the underside of the gallery; if more than one gallery is used there should be a clear height of 7 ft 6 in from the floor of one gallery to the ceiling of the next to permit the installation of standard height bookcases for use without ladders or steps. Many librarians do not like working galleries in reference rooms and the gallery shelves are consequently reserved for the storage of little used books, but this seems to be unnecessarily wasteful of useful space in the building. The gallery system may be extended from mere book storage space to working galleries with reading tables, or even to an alcove system over alcoves on the lower level. Figure 22 illustrates some of the various possibilities that arise in gallery planning. Type A in Figure 22 shows the simplest form with a gangway wide enough for circulation, in addition to bookcases lining the walls; these gangways should be at least 3 ft 6 in and preferably 4 ft

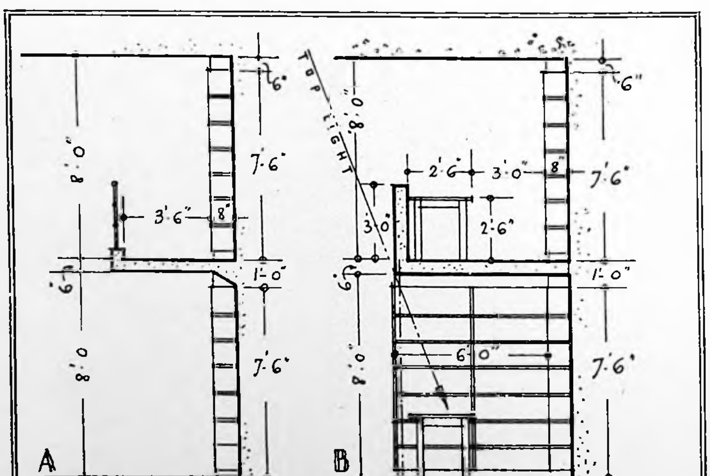


Figure 22

wide in the clear, to allow convenient movement of book trolleys. The floors are generally constructed of fire-resisting material covered with wood, rubber or linoleum, the latter two being better from the point of view of reducing noise. Type B shows a gallery of greater projection and therefore not usually of cantilever construction as in Type A, the bay-divisions will probably make a cantilever unnecessary. This type is designed to accommodate reading tables so that students may work in close proximity to the books to which they wish to refer. The tables are placed on the outside of the gallery and are lighted from top-lights over the central part of the main room, thus overcoming the necessity of providing windows on the outside walls of the room, which would be impossible in many schemes. An allowance of 2 ft 6 in of space is made for the tables, which may be single or dual (in the latter the readers are placed face to face) and an allowance of 3 ft is made for the gangway, which is less than in Type A, as book trolleys may be turned between the tables. The elimination of the windows permits the whole of the wall area to be used for book storage. The placing of the tables on the outside of the galleries makes supervision from the lower floor easier and does not destroy wall bookcase space. If this scheme is adopted, bookcases projecting from the walls may be used on the lower floor, thus dividing the area below the gallery into alcoves and at the same time giving screened bookcase space. If the projection of the gallery is made 6 ft from the base of the wall bookcases, two standard 3 ft wide book stacks may be used instead of having to make special sized cases. The alcove tables on the lower floor should be placed directly under the gallery tables so that they may receive daylight from the top-lights of the main rooms and also to allow circulation space round the tables for access to the wall cases. If windows are introduced there is again a loss of wall shelving and the table lay-out may be slightly modified.

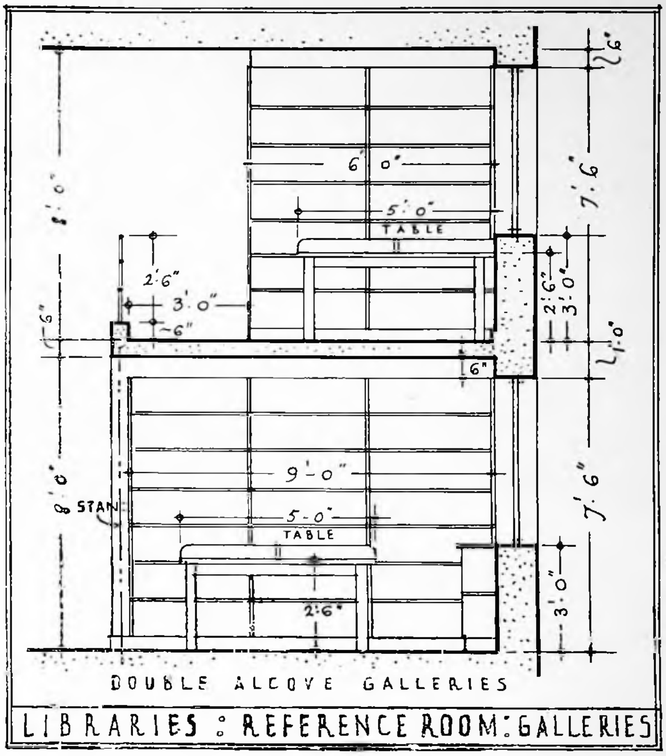


Figure 23

Figure 23 illustrates the two-story alcove type which is specially useful in libraries where there are many comparatively small classifications of books on specialised subjects, as one or more alcoves may be devoted to each subject and students are then able to work near all the books they want without moving about the room or referring to the staff. For the table lay-out shown in Figure 23, it is assumed that the main wall of the room is external and therefore the alcoves each have a window at each level; on the lower level, where more space is available, bookcases are placed under the window and the tables, which are designed for four persons, are so placed as to give circulation to the wall cases. On the upper level, in order to provide full gangway space, the tables are placed against the window wall and the wall shelves eliminated. This may be suitably planned on the basis of a projection of three standard 3 ft cases on the lower level and two similar cases on the upper level. It is essential that strong balustrades are put round all galleries and it is usual to make these of an open type to permit of supervision from the lower level. It is wise, however, to have a 6 in solid riser to prevent anything on the floor being kicked through the balustrades and dropping on the heads of those below. In Figure 22 B, owing to the tables being against the balustrade, the latter should be of the fully solid type, as supervision of the tables is not difficult, and objects are prevented from falling from the tables into the room below; as this balcony is not very wide, those working at tables and the shelving are still fairly well within view of the staff. It is desirable that there should be small book lifts to connect all the gallery levels to the main floor level. The staircases between the various levels should be at least 30 in wide and in general should not be of the spiral type, as the latter are difficult to use, more especially when carrying a load of books. There should be two staircases to each level unless the galleries are very short. It is frequently possible to plan the staircase outside the main walls of the room, approached from lobbies at each level; and such a system does not waste wall space, nor do the staircases make unsightly projections in the main room. Staircases placed on the outside of the galleries are very unsightly, more particularly when of the spiral type. When alcoves are used, the end bays on a length of wall are often made of such a size as to accommodate staircases, so that the general treatment of the room is not affected and the ordinary gallery circulation or the normal bookcase lay-out is not impeded. It sometimes happens that galleries are planned to be approached from other parts of the library than from the main floor or the reference room of which they form a part; with such a lay-out the main staircases of the library may form the communication between the levels and special secondary staircases are not required.

The front edge of the gallery projection may be used very conveniently for the fixing of artificial lighting reflectors for the general illumination of the main room, the source of reflected light being from the main ceiling of the room. The thickness of the gallery floor may also be used for letting in flush or semi-flush lighting fittings to serve the parts of the room under the gallery. Alcoves which do not have windows are continually in need of proper artificial light and this may affect the level of the underside of the gallery floor; consequently, some space above the normal bookcase height (as shown in the figures) is often desirable.

Commercial and Technical Rooms—Many central libraries now make special provision for commercial and technical users, more especially in relation to important local industries. When such collections amount to more

than a few books, separate rooms are set aside, generally consisting of a combined reference and stack room. The greater number of users need rapid access and do not spend long in the library at one time. The books to be housed are standard technical, quick reference and encyclopædic works, together with official pamphlets and reports, news-cuttings, catalogues and price lists. They are accommodated in normal shelving of suitable sizes, but some of the other publications, such as news-cuttings and catalogues of all shapes and sizes present storage difficulties; catalogues seem to be dealt with most satisfactorily in box files, which can be placed in shelves either horizontally or vertically, the former being better in many ways, as loose sheets are less liable to damage. Figure 24 illustrates two typical methods of shelving for box files. Adjustable shelving is the most useful, especially for vertical filing, in that different sizes may be placed in one set of shelves. When horizontal files are used shelves should be placed at frequent intervals as all but the top file on each shelf are difficult to remove; it is suggested that three box files, one on the other, are the maximum number that is practical.

Commercial libraries also need ample display and storage space for periodicals. An important factor to be borne in mind in the design of the periodical stacks in commercial libraries is that reference is very frequently needed to back numbers during the interim period between issue and binding, and for that purpose a special type of shelving is suggested as shown in Figure 25. The idea of this shelving is that the current issue of each paper is shown on a rack which forms a cover to the shelves on which are placed past numbers until such time as they are removed for binding. This system keeps the back numbers reasonably clean and free from dust, saves the staff much time in turning up back numbers needed by inquirers and occupies comparatively little space.

Commercial libraries, if they are to be of real value, must provide information very rapidly, and consequently need a very careful and complete filing and cross-reference system which will occupy more space than is generally needed for a similar amount of ordinary library work. Some reference libraries cater for supplying information of an urgent nature by telephone and consequently an efficient system is essential.

Music Libraries—Very many public libraries have music collections. The music may be bound in volumes for each instrument, but for loose sheet music for several voices or instruments which is to be lent as a set, binders seem the most efficient method of handling. The shelving for music is usually divided into short lengths of about 18 in between verticals as the bindings may not be very stiff and the volumes are generally thin and therefore difficult to handle.

Prints—Many libraries avoid collecting prints, engravings or photographs owing to the difficulty of storage and handling excepting when they are bound in volumes.

Smaller pictures can be mounted on uniform sized cards and may be filed in a large size vertical-filing cabinet, in which form they are easily handled and do not suffer much damage. Larger pictures have to be stored flat either on shelves or in horizontal-system box files to prevent damage; such pictures should be mounted on one of about three standard-sized mounts which can be placed in large chests of drawers similar to plan chests, or they may be laid on flat shelves which slide out; both methods however, are liable to damage the pictures owing to pulling one mount across the face of another drawing or print. Vertical filing similar to that now used in some drawing offices might also be considered; vertical filing may be either of the suspended type or similar to a very large card index; in either type the risk of damage seems likely to be less than when a horizontal system is used. Some libraries also use box files for small maps, prints and drawings.

Maps—Most reference libraries have to stock a number of maps, and these may be treated in any of the ways suggested above for prints. Some libraries roll up maps and store them in tubes which are placed in racks having vertical and horizontal divisions at 9 to 12 in intervals; this method is, however, unsatisfactory, as any paper that has been rolled is difficult to consult.

Lantern Slides — Some libraries now make and keep collections of lantern slides. The usual method of storage is in cabinets of drawers of

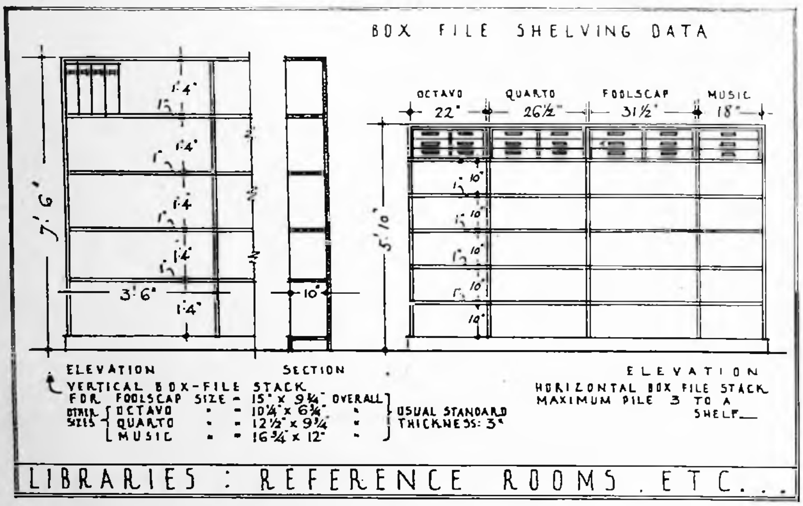


Figure 24

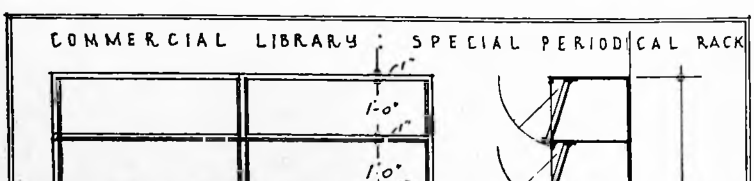


Figure 25

the correct size for the slides; the drawers should not be too deep and not more than two slides wide, as slides are heavy and the drawers, if large, become difficult to handle. A card for each slide is usually put in the drawers recording the correct position of each slide, together with its number and classification, both of which are also marked on each slide.

Work Rooms—The private office of the chief librarian is generally a moderately large room, as it usually has to serve also as the committee room, although sometimes a separate committee room is provided. Separate lavatory accommodation is usually attached to this room. Some book shelves are needed in addition to the usual office furniture for a private office. A strong room or large safe is sometimes placed in or adjoining the librarian's room, but in large libraries it is too large for such a position and is placed in the basement. It is essential that good ventilation be provided in the strong room, as books and papers of value have to be stored in it.

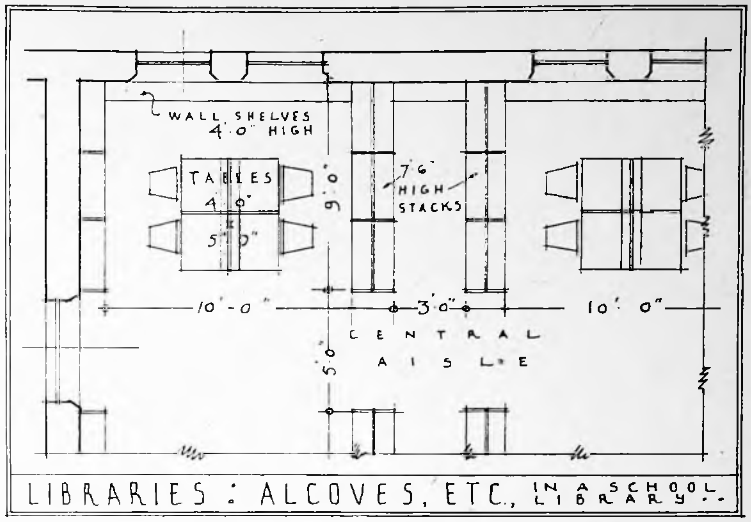


Figure 27

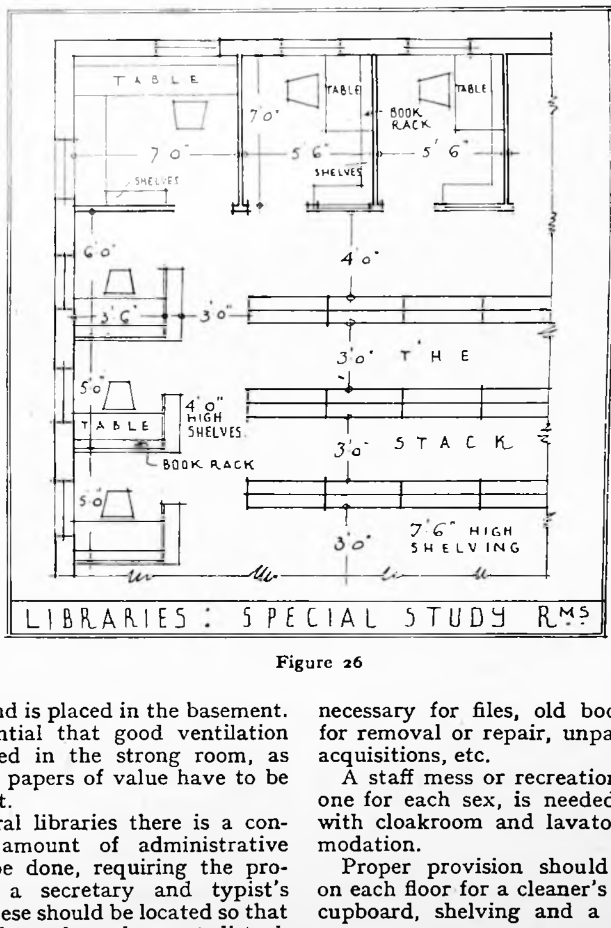


Figure 26

In central libraries there is a considerable amount of administrative work to be done, requiring the provision of a secretary and typist's rooms; these should be located so that the noise from them does not disturb the library or work rooms where quiet is essential.

The work rooms for the staff must be well-lighted, airy rooms, suitable for continuous working. They are equipped for various purposes such as cataloguing, filing, book repairs and binding and tables, benches, cupboards, sinks and services, as necessary for each type of work, should be provided. At least one store room is necessary for files, old books, books for removal or repair, unpacking new acquisitions, etc.

A staff mess or recreation room, or one for each sex, is needed, together with cloakroom and lavatory accommodation.

Proper provision should be made on each floor for a cleaner's store with cupboard, shelving and a sink.

SPECIAL LIBRARIES

Libraries attached to schools, universities and learned societies are similar to public reference libraries in all general respects, but usually make special additional provision for students making detail researches into particular subjects. For such purposes study tables, separate study rooms for individuals, or for several persons are placed in or adjoining stack rooms, so that students may obtain the books which they require with the minimum of help and supervision by the library staff. Provision for these students may be made in several ways; firstly, by the provision of tables in convenient places between stacks; secondly, as shown on the left-hand side of Figure 26, by placing a row of tables at the side of the stack room, divided from the main stacks by low bookcases about 4 ft high, to allow light from the side windows to reach the main book stacks; a division or screen is placed between the tables, and this may be also about 4 ft high; a tall glazed screen is an alternative. These recesses or cubicles should be about 3 ft 6 in wide and not less than 5 ft long), with a table across the full width; in front of the tables should be book racks for open volumes and shelves for other books, etc. Doors are not required to these cubicles. Good day and artificial light is essential.

The third type, for more important students making special researches which may take a long time to complete, individual study rooms are sometimes provided, as shown in the upper part of Figure 26. These rooms should be divided by partitions, and have doors to lock, as books of value may be left in them at closing time each day. The rooms should be divided from the stack room either by glazed partitions, or preferably by solid partitions with similar partitions between the rooms themselves. Such rooms are best placed parallel to the stacks, so that the ends of stacks are open to the light from side windows, or only separated by low divisions as shown in the figure. In planning the study recesses or rooms, the dimensions should be based on the steel lay-out required for the standard book stack steelwork, especially where multi-floor stacks are required. The individual study rooms require to be about 5 ft 6 in wide by 7 ft long

and need a bookcase and a table for reference or for spreading out papers, in addition to the normal reading-table and book-rack fittings.

Many university and similar libraries use the alcove system to a very great extent, and therefore combine the reading rooms and stack rooms into one or more rooms of the above type. Figure 27 illustrates a type of alcove system in which rather more books can be accommodated than in the standard type previously illustrated, where two alcoves are divided by a single double-sided stack. The type shown has two double-sided book stacks between each pair of alcoves, with a narrow gangway between the two stacks, which only needs to be about 3 ft wide. In all other respects the planning of the alcoves remains as previously illustrated. It should be noted that in the method shown in Figure 27, the windows may be planned so as to provide the wide spacing which is an especial point where more monumental types of building, such as a large school, are concerned, or where the library faces on to a college quadrangle. The 3-ft book spaces between the stacks may well be lighted artificially with local switches, which are only used when books are actually required.

The requirements of special libraries for learned or technical bodies and societies vary very considerably owing to the variety of types of materials to be housed. Scientific and legal libraries, for instance, have to have large numbers of past periodicals available for rapid consultation, while others may have especially large collections of maps, prints, or manuscripts which need very different accommodation ; but for all the general housing of books, standard shelving serves as a basis for the main needs of the library ; the special individual needs of each particular case are an additional problem.

Lighting—Artificial lighting is a matter which cannot be too greatly stressed as needing very careful attention in library buildings, in order to provide really adequate light, on reading surfaces in reading rooms, and on bookcases in lending libraries and stack rooms. Glare must be avoided, and also strong shadows. General lighting is essential in addition to any local lights that may be fixed to fittings or furniture, and on the whole the latter is frequently unsatisfactory, as it is better if all furniture is movable.

Ventilating and Heating—It is essential that library buildings in which persons have to sit for long periods be properly heated and ventilated, but the care of the books must also be carefully considered. Dampness must be eliminated in the stack rooms, but excessive heating is, at the same time, detrimental to the books. Ventilation must be so arranged that wall space suitable for book stacks is not used more than necessary. Heating must be specially considered near entrances to rooms where doors are being constantly opened and closed. Radiator positions must also be considered in relation to book stacks, as they may cause loss of stack space and also damage books. Low temperature panel heating in ends of stacks or in ceilings should be given special consideration and is often more suitable for the comfort of readers than local floor or wall radiators placed near readers' tables.

16. *Fire Stations*

Introduction—This section is concerned with the basic factors connected with the planning of fire stations. The general requirements are fairly simple, but the actual work of erection of such buildings is very much complicated by the large amount of special equipment needed in conjunction with such matters as the call apparatus, checking of time and heating of machines, all of which have very little bearing on the actual planning of the building other than requiring space for ducts, conduits and wall-space for dials, switches, etc.

Fire stations vary considerably in type; on the one hand, there are the small lock-up stations needed in villages and small towns where the personnel is largely, if not entirely, voluntary, with normal occupations elsewhere and, on the other hand, large stations with many appliances and a large permanent staff, working in shifts or on a reserve system, many or all of whom are housed on the same site as the fire station.

Methods of organisation of the personnel also vary and affect to some extent the planning of the buildings, more particularly in regard to rooms other than those for the housing and administration of the actual fire appliances. Small fire brigades in villages or attached to private firms or to estates depend on a volunteer system, while quite large towns often employ a small full-time staff assisted by volunteers; in still larger towns and cities the brigades consist largely, and often entirely, of full-time fire officers, even when the fire brigade is organised in conjunction with the local police force, as is sometimes the case in those districts administering their own police force as well as the fire brigade. When full-time officers are employed, it is desirable that as many as possible should be housed in the same building, or preferably on the same site, for ease of assembly in times of emergency, even when they are nominally off duty.

It has also become customary in many areas to house at fire stations other emergency equipment such as ambulances, which are mainly and regularly used in co-operation with the police, hospitals, etc., but are required from time to time in direct conjunction with the fire appliances. Advantage may be taken of using the same call systems, relief staff and repair workshops for ambulances as for the fire brigade, when the two services are operated by the same authority.

The Site—The choice of sites for fire stations seldom seems to come within the sphere of the architect, but there are certain very desirable features which should influence the selection of sites, especially when these are situated on busy streets. Sufficient land should be acquired to permit of extensions, unless the area is already fully built-up and not likely to be changed greatly in the future; sufficient land for adequate drill yards, repair shops and, if required, housing for the staff and their families is essential. In many schemes put up in the past very cramped sites have been chosen in order to obtain stations in central built-up areas, a reason more important in the days of horse-drawn vehicles than with modern mechanical appliances.

There is considerable variation of opinion as to whether fire stations should or should not be placed on main thoroughfares, or whether they are better located in minor or side streets. The important factors would seem to be ease of access from the street in which the station is placed to all parts of the area to be served, ease of traffic control and streets sufficiently wide to allow rapid but easy turning out of the station in all directions. Sites placed on corners may appear to have some advantages from the point of view of access to all parts of the area, but traffic may, in such places, easily cause difficult congestion even when traffic lights are operated from the station to stop all traffic in the neighbourhood. Machines leave the station so rapidly after a call is made that the street traffic has but little time in which to stop, or to take up position out of the way, nor has congested traffic at a street crossing time to get away and leave the roads clear in all directions. Figure 1 illustrates three sites for fire stations; Diagrams A and B are both corner sites, but C shows a site with a normal straight street frontage away from side and cross streets. In both Types A and B the turns into the two streets on each side of the station are rather difficult, while the access to the other street or streets involves difficult routes across traffic lines. It is very advantageous to have a secondary means of access to the appliance room, either from a side or back street into the drill and vehicle washing yard, in order to avoid the necessity of backing the engines from the street into their positions; if there is a yard sufficiently large approached from another street the machines are driven straight to the places indicated on Figure 2.

Main Accommodation—The most important unit of the plan is the appliance room, in which all the vehicles to be housed stand ready for immediate departure. Vehicles should be arranged in a single line, but only in exceptional circumstances should vehicles stand in front of each other. Exit doors in front of each vehicle are essential. Behind the vehicles a further set of doors giving access to the drill yard and washing space, as already mentioned, should be planned in conjunction with the secondary approach. Part of the washing space should be covered. Adjoining the appliance room and

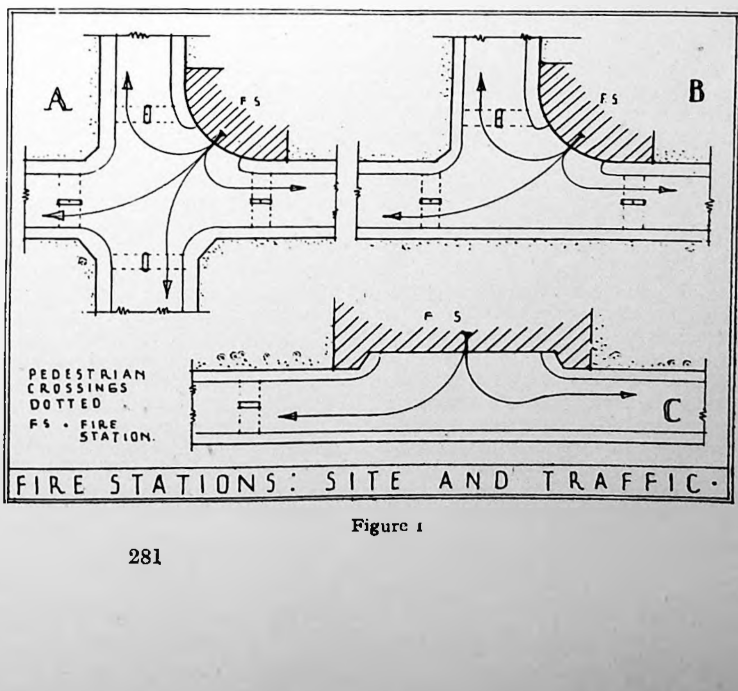


Figure 1

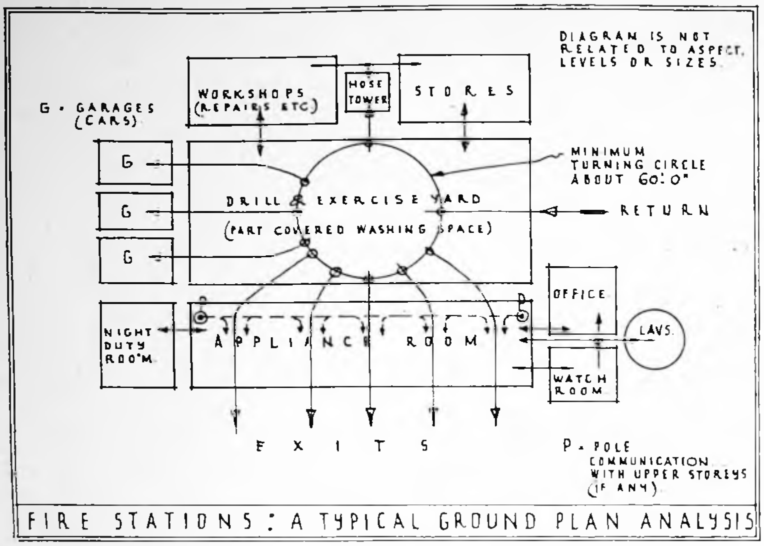


Figure 2

communicating with it, must be placed the watch or duty room in which officers are on constant duty and have all the means of communication in their control, both for communication from outside and for internal communication, recording and control; various call systems are employed in larger cities, such as street call boxes and telephones. It is general to provide an office, preferably near the watch room, for the chief officer in charge of the station. Rooms for recreation, meals and resting when on night duty are provided or not, according to the system on which the staffing of each station is operated, and when these rooms are provided on an upper floor the other floors should be connected to the appliance room by means of poles down which the firemen slide; these poles should be placed near the back wall of the appliance room in order to assist circulation to all the machines without confusion. Workshops for repairs are needed and in larger stations these become quite important rooms. A room for drying uniforms is important and sometimes also for hose drying, although the latter is frequently dealt with in hose towers, which also form part of the practice and training apparatus.

Appliance Room—The main room of the fire station plan is the appliance room, in which all the engines, tenders and other vehicles are housed. The size needed varies considerably in each scheme; separate bays are really essential for each vehicle, as it is most unwise to stand one appliance in front of another. There is no certainty as to which one will have to leave first, since the nature of the next emergency call is unknown. The width of the bays generally provided is about 15 ft centre to centre, but in smaller stations, in stations where sites are very expensive, or in congested areas, the bays are sometimes reduced to about 12 ft centre to centre. Full circulation round each vehicle should in all cases be provided. The depth of the appliance room is also variable, and depends largely on the size of the apparatus chosen to serve the locality; for the larger type of station a depth of 40 ft is needed to house machines having 100-ft turntable escapes or fire towers and to leave adequate circulation space round each machine. Some of the largest machines used in the main city stations are about 31 ft long and the full legal limit of 7 ft 6 in wide. The depth needed in stations where only smaller apparatus is to be housed should be about 30 ft to leave sufficient circulation space. The height needed for the larger appliances is a clear space of 15 ft, although in some stations this height can be reduced to about 12 ft in the clear; these heights not only are needed under all beams in the appliance room, but in the door opening to street and to cleaning and drill yard.

Various equipment is needed in appliance rooms, such as heating, signal lights, exhaust ventilation, time-recording and door-opening gear. Each scheme has some or all of these various installations, but their direct effect on the planning of the building is not considerable and, in fact, many of them do not affect general lines of the plan in any way whatever; consequently it is not proposed to discuss such equipment at great length in these articles. The value of some of this equipment seems somewhat doubtful and if involving too much complication in installation and difficulty in practical use, the cost does not always appear justifiable and only those installations which are simple to handle and really assist in the efficiency of the fire brigade service should be installed

The main doors require careful thought, more especially with regard to opening gear. Owing to the large size of the openings, doors in four or six folds are general, two or three folds moving to each side. Many systems of operation have been installed, and special claims are made for each type. Some are opened by hand at the doors themselves, others from the watch room, others by the driver of each vehicle when he is ready to move. Motor-driven systems, it would seem, should be avoided unless every possible breakdown can be guarded against; also it seems unwise to open the full range of doors if only one machine is to leave, especially in winter-time, when engines need to be kept as warm as possible. One good system appears to be the operation of one set of doors by the driver close by (or when seated in) the driver's seat and quite ready to move; this is accomplished by the installation of a vertical cable pull geared by means of arms and levers on to the door locks and bolts.

Many fire stations have installed plant to remove the exhaust fumes from the engines, which are started up and run in the appliance room several times a day (in some brigades every two or three hours). The value of such an installation is thought by many authorities to be very doubtful, especially if involving direct connections to the exhausts of the vehicles. If, however, such an installation is made, great care must be taken that it is so placed that all machines, whatever the overall lengths, can be connected to the duct, which means that it must be placed slightly to the rear of the longest machine, and so calculated as to provide easy bends for the flexible piping, but not so far back that the connections prevent easy and rapid circulation from the sliding poles (if any) to all machines.

Various systems of keeping the engines warm in cold weather are installed to ensure immediate starting. Heating panels have been placed above and below the engines, but these may not be very effective when the doors are open as they have to be for at least parts of the day. If a system depending on direct connections to service mains is installed, such as electric immersion heaters, great care must be taken to make it impossible for the engine or escape to move until the mains or services are disconnected. A repair pit, as outlined in the section "The Motor Vehicle," should be installed in one of the bays if a separate workshop or repair shop is not provided elsewhere in the scheme, as is general in large schemes or at the central fire stations of areas which may have several sub-stations.

Wall space at the ends of the appliance room is often used for pegs on which certain parts of the firemen's uniform equipment, such as coats, belts and helmets are placed, ready to be snatched up when passing from the sliding poles to the appliance which is to leave in answer to a call. Figure 3

illustrates very clearly the importance of placing the sliding poles near the back of the appliance room, so that all access to the vehicles is from the space at the rear of the machines; thus no person runs any risk of passing in front of a moving engine.

Various alarm, light and directional indicator systems have to be installed, each of which has indicators in the appliance room; some stations also install a special light system (when there are several appliances) to indicate which appliance is to leave first.

Figure 3 illustrates the main essential sizes needed in plan and section for appliance rooms, but as already stated, these are somewhat dependent on the type and size of appliances needed in each brigade area also whether ambulances, extra tenders and special officers' vehicles have to be housed. It is important that at least 4 ft space should be allowed between the front piers and the engines, in which the doors may open and, if necessary, a person can pass when the doors are at right angles to the road, and at least 4 ft, and better rather more, is needed for the circulation at the rear of the appliances.

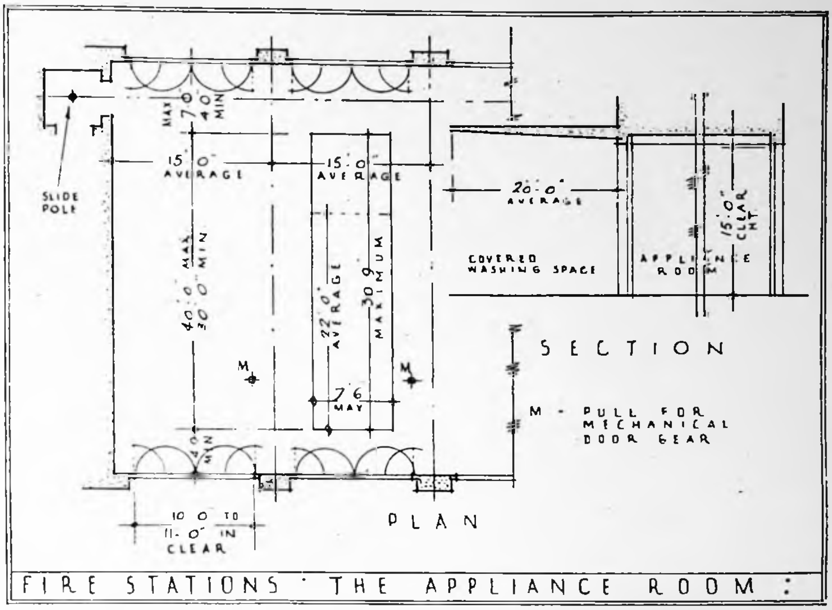


Figure 3

Behind the appliance room, and approached directly from it by doors similar to those on the street frontage should be a covered and paved space for drill, cleaning and minor repair work; this covered space is best if it is sufficient for the longest machine to be covered, and this may be at least 30 ft. It is most desirable, for ease of handling the vehicles, if the covered space is free from all obstructions such as piers or stanchions; a cantilever principle meets this demand well, more especially when the overhang is less than the suggested 30 ft, as is sometimes provided. These covered spaces should be glazed in some way, not only to light the area below the roof, but also to assist in lighting the appliance room itself, which generally depends for daylight on light from the upper glazed parts of the doors on to street and yard frontages.

Sliding Poles—The sliding poles used for communication between floors are generally of brass or bronze and about 3 in. in diameter; whenever possible, they should be in one length without joints, but if jointing is necessary great care must be taken to ensure perfectly smooth junctions. Poles usually extend from one floor to the next floor below only; separate poles are used by the firemen on each floor in order to eliminate the possibility of men from one floor dropping on to men standing on or starting from a floor below; the most general arrangement is to change poles at each floor level. The space required for the enclosure or opening in the floor round a pole should be from 3 ft to 3 ft 6 in across; these enclosures are usually square and should have smooth walls without breaks or projections of any kind. Poles are sometimes placed in the appliance room itself without an enclosure and such poles should be placed about 1 ft 6 in from any adjacent wall or projection; a position for the pole in the appliance room, instead of in an enclosure, appears to be more dangerous as many persons may be moving about in the appliance room and it is consequently more difficult to get away from the pole rapidly. Great care has to be taken in planning of doors giving access to poles as it is essential that very rapid access is possible, but at the same time there must be no risk of accidents due to unprotected openings in walls or floors. Figure 4 shows a typical arrangement of sliding poles at one floor level when there is another pole adjoining for access from an upper floor. The pole from the upper level delivers persons in such a position that they can see the doorway giving access at that level to the pole serving the next portion of the drop. Doors must open in the direction from which the men come and must open clear of the pole enclosure space; the doors are usually fitted with self-closing apparatus and also a locking gear or spring catch which has to be released before access to the pole is possible. In order that the doors may be housed within the reveals at each side of the door opening as shown on Figure 4 they are often made in pairs instead of being hung as single doors. At the base of each pole, a cushion or mattress is needed which is often in the form of a thick rubber pad fitted closely round the poles.

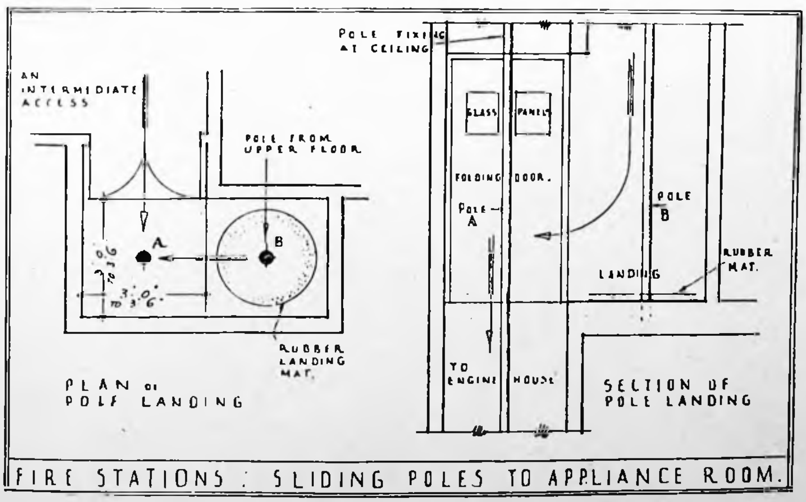
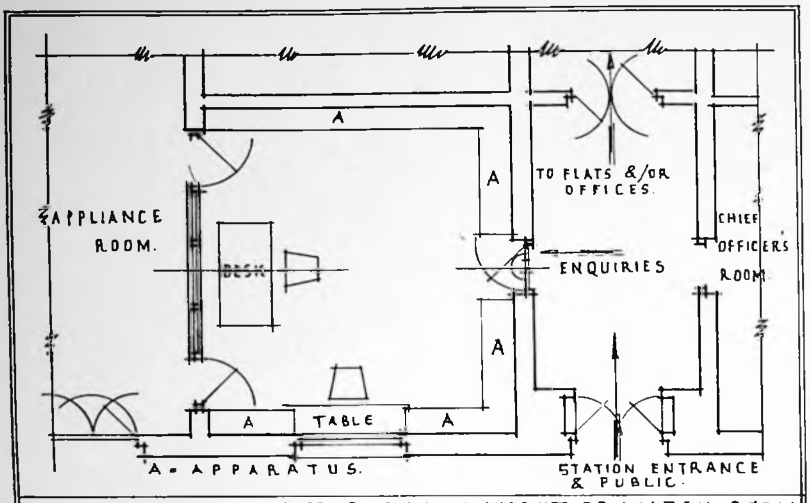


Figure 4

Watch Room—A room is required adjoining the appliance room to serve as watch or duty room. The size of the room needed varies very much



FIRE STATIONS : A TYPICAL LAYOUT OF WATCH ROOM.

Figure 5

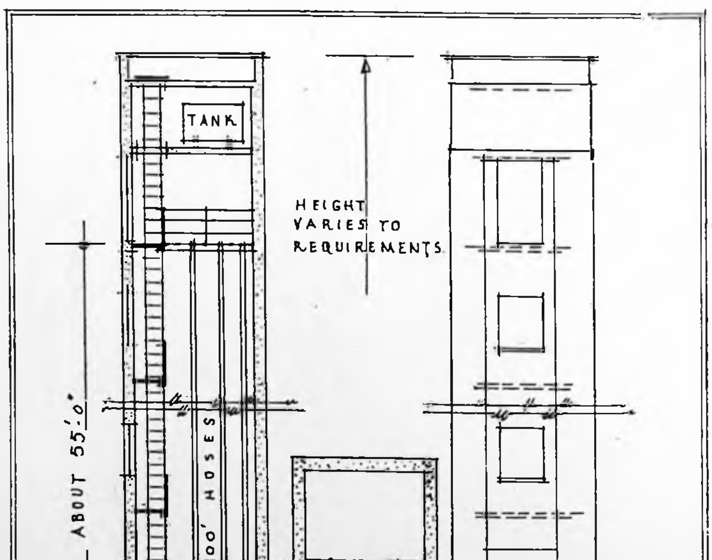
according to the amount of call and recording apparatus to be accommodated and to some extent on the size of the district to be served. The entrance to the fire station should be adjoining the watch room in order that it may control all persons entering the building including both staff and visitors. There is often a hatch or counter for inquiries between the watch room and the entrance hall or lobby. A considerable length of wall space is essential for apparatus, such as telephones, alarm indicators and recording apparatus of various types. The room should have good daylight as it is in constant use. It is most essential that this room should not be cramped in area as changes and increases in the amount of apparatus are frequently needed and the efficiency of the station is largely dependent on the good working of the watch room and its staff. It is quite usual to place a small office near or even adjoining the watch room for the use of the chief station officer; this room is a normal type of office room and requires no special planning or equipment. Figure 5 illustrates a typical watch room, station entrance and the relationship of the watch room to the appliance room.

Staff Accommodation—The upper parts of larger fire stations are used for staff rooms and also in many schemes for housing part of the station staff. In many small districts where the fire brigade is voluntary, little space is needed in addition to the appliance room, drying room for hoses and equipment and an office; larger stations have one or more full-time and resident officers (often the chief officers) with the remainder of the staff being volunteers, stations of this type require a small watch room and the upper floors may be used as living accommodation for the full-time officers.

The large stations in more important areas require an entirely full-time staff, and it is general to house these men in whole, or in part at or adjoining the station. Single men are often housed in the station itself and, at least, a number of the married men in flats or cottages over or adjoining the station. Most of the larger stations have part of the staff (even when living very near the station) on duty at the station itself, and for the benefit of night shifts, provision is made in special bunk rooms or other communal rooms for the men to rest without undressing during these night periods.

All large stations provide rooms for recreation of their staffs and also for meals, at least when on duty. These rooms have to be planned on a more generous scale in those stations having a number of resident officers. The rooms required for housing of unmarried officers are planned on the general lines of a hostel with small bedrooms or cubicles with communal dining- and recreation-rooms. The planning of this part of a fire station has no special points other than the possible provision of the sliding poles, although it is doubtful if men on duty would be allowed to rest in their bedrooms.

Drill Tower—Nearly all fire stations are provided with a tower which serves the joint purpose of hose drying and for drill in connection with fire brigade training. There are no very definite sizes for these towers, but an average size seems to be about 10 ft by 10 ft inside the enclosing walls, although many are rather smaller. The height, often about 60 ft is governed by the length of hose used, which has to be suspended for drying, either by its end or by the middle of a length and the height thought desirable in each district for the purpose of a practice tower. The tower should have a large opening at the base into which a hose truck can be wheeled and in some districts provision is made at the base of the tower for heating coils or braziers to dry hoses in cold and damp weather. The tower itself is built on the lines



FIRE STATIONS: A TYPICAL DRILL & HOSE TOWER.

Figure 6

of one bay of a building complete with window openings from which rescue work with scaling ladders, escapes, etc., may be practised. It is general to provide landings at each normal floor level connected together by steps or ladders ; these landings must not take too much of the internal area of the tower as sufficient space for the hoses must remain. The hoses are drawn to the top of the tower on pulleys either by hand, or in some stations by a mechanically operated winch. In some schemes a water tank is installed for practice work at the top of the tower to which water is lifted by pumps from sumps in the drill yard in which the water is re-collected.

Figure 6 shows a typical hose and practice tower in section, elevation and plan. The towers are constructed in various materials such as brick, concrete, but sometimes are only steel frame skeletons.

Some chief officers prefer to use the tower only for drill purposes and to use drying rooms for hoses in which it is claimed that hoses may be dried more rapidly, which becomes a matter of importance in more congested areas ; such drying rooms are dependent on some forms of heating together with a method of extraction of the humid air from the room. A hose-drying room, if provided, is generally quite apart from the usual drying room provided for firemen's clothing ; these drying rooms need ample ventilation together with heating coils over which the clothes are suspended on racks.

17. *Hospitals (General)*

Introduction—The information given in this section is primarily based on the requirements of a hospital having 150 to 200 beds and, therefore, any sizes given must be considered as relative to this number of beds or as minimum for general purposes in any hospital. Isolation hospitals are discussed separately in Section 14 as they have somewhat different requirements.

General Lay-out—The working efficiency of a hospital depends very largely on a well-arranged lay-out; it must be as compact as possible, with the utmost attention paid to adequacy of light and ventilation. Concentration of units provides easy administration, reduction of labour and is less expensive in first cost. There are two general methods of lay-out: first, the horizontal type which is often adopted in England and, secondly, the vertical type favoured in America. Buildings planned on several floors are cheaper in first cost, chiefly on account of the concentration of services; but such a method is more difficult to extend and fire escape also presents a more difficult problem. Ward-blocks, if of the double-sided type, are usually placed with the main axis north and south, with the main inter-communication corridor running east and west. This aspect is adopted to permit the maximum amount of sun to enter the side windows of the wards at some time during the day. It has the additional advantage of providing an end with a south aspect for a sun-balcony or solarium.

All parts of the administration building should be readily accessible from the entrance and these official parts of the hospital must be easily connected with the wards.

Out-patients' and casualty departments should be entered separately and should be as near as possible to the street. In this connection, however, it must be remembered that the radiological and electrical departments must be available for both internal and external patients. The kitchen department must be a centralised unit equidistant from the various sections of the buildings served, but at the same time must have easy access for deliveries from outside.

The nurses' home is generally required to be detached from the hospital, but should have easy (and preferably covered) communication to the dining-rooms and administrative block and also to the ward units. The nurses' home should, if possible, be provided with a private garden and tennis courts. The boiler house and laundry blocks should be placed as centrally as possible, to reduce heat loss and main-pipe sizes; but at the same time it must be kept away from

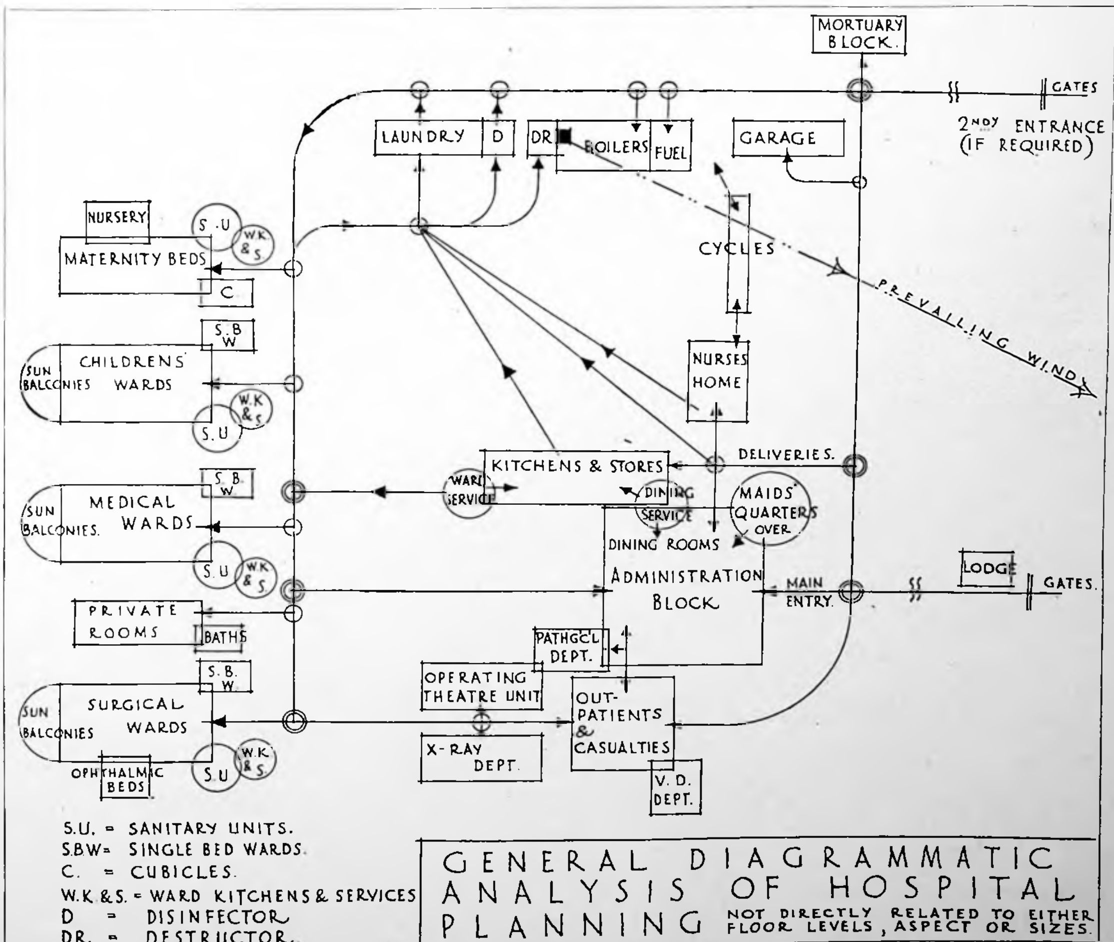


Figure 1

the wards, on account of noise and dirt, and be placed in a suitable position for deliveries of fuel and so that smoke and smells are blown away from the wards by the prevailing wind. The laundry, being a large user of steam, should be near the boiler house.

The mortuary unit should be placed out of general sight from the wards, with, if possible, a separate entrance from the public highway.

Figure 1 illustrates the relationship of the various parts of a typical hospital plan on the basis of the suggestions made above, and is intended to make clear the general fundamental circulations required in hospital planning. It should be noted that the wards are grouped together, which is particularly necessary for food service and that the paying patients' rooms are placed between the surgical and medical departments, as they may be needed for either purpose. The operating theatre unit is used mainly

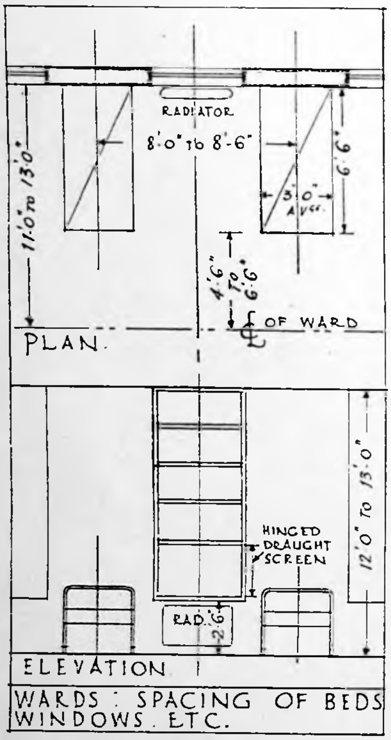


Figure 2

in conjunction with the surgical wards, but it may also be needed for casualties. The X-ray and electrical departments are often required to be available for ward and out-patients' use, and should therefore be placed convenient to both sections. The pathological department is in the main building, as this department may be used by both ward and out-patients' units. The individual planning of all rooms, especially those for service purposes, is mainly dependent on the fittings and equipment to be placed in them. This diagram does not consider the relative aspects of the building nor does it attempt to place the requirements in relation to any site.

Wards—The number of beds placed in a ward varies considerably, but eighteen and twenty-four seem to be common numbers for large surgical and medical wards.

There are two alternative methods of bed lay-out, firstly, that in which the beds have their heads against the outside walls of the ward which is the most usual method adopted and secondly, those in which the beds are parallel to the outside walls. Figure 2 illustrates the normal "double-sided" ward with bed-heads placed against the window walls. As sizes are generally based on an allowance of 100 to 125 sq. ft. of floor space per bed, which allows a ward of about 24 to 26 ft wide and a bed-head space of 8 ft to 8 ft 6 in each, 22 ft is the minimum width for a ward. The heights of wards are generally 12 to 13 ft, but in some schemes have been reduced to as little as 10 ft in the clear; but this reduction provides rather a low cubic content per bed if the floor dimensions remain unchanged. Some schemes provide as little as 950 cu. ft., others as much as 1,500 cu. ft.; the general recommended provision seems to be about 1,200 cu. ft.

Figure 3 shows two alternative methods of arrangement based on the planning of beds parallel to the window walls. Glazed or curtain screens are used to divide the beds. Many claims are made in favour of the parallel bed type; windows may be of increased area, and if made of a folding type may open for practically the whole length of the ward wall, this obviating the necessity of providing sun-balconies and the moving of beds on to these balconies. It is also claimed that there is greater privacy for each patient, bad cases are less disturbing to the remainder of patients in the ward, and beds are more easily screened. Further claims are that wards are quieter and ventilation is better controlled. The objection seems to be that wards are more difficult to supervise from one end of the room, where the ward kitchen is usually situated, as half the patients have their heads towards the kitchen, and when lying in bed may be hidden by the solid portions of the dividing screens if these are used.

The difference in aspect between the two types shown in Figure 3 also affects the type and spacing of windows in the ward walls. Instead of the regular spacing of windows between beds at about 8 ft or 8 ft 6 in centres of the type of ward in Figure 2, the windows should be grouped in pairs or made into one large window in order that the draught is kept away from bed-heads. If very large windows with a southerly aspect are used, as in Type B, Figure 3, they must be so designed that the amount of ventilation can be controlled easily. Light mainly from one direction is more pleasant from the patients' point of view, as it is possible to lie in bed without looking towards a window, but, nevertheless, cross ventilation is essential.

A further and important point in favour of wards as planned in Type B of Figure 3 is that the ancillary rooms such as sink rooms, ward kitchens, duty rooms, etc., may be grouped together in the centre of the north wall and thus be placed more equidistant from all beds than is possible in Type A which must have these ward service rooms on one end if light is not to be taken away from one pair of beds.

The essential difference between the two types is that Type A must have

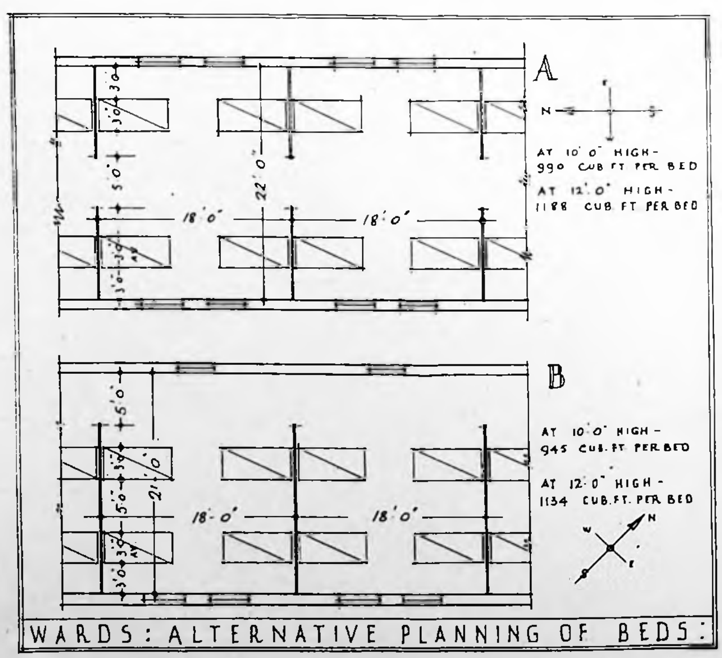


Figure 3

its long axis from north to south whereas Type B should be from approximately east to west. In Type B the windows should be reduced to the minimum on the north or north-west wall to provide sufficient cross ventilation while allowing the main light to be from the opposite wall.

Beds should be placed at least 2 ft from the outside walls, and preferably 3 ft. If two beds are placed together, as in Type B, Figure 3, they should be at 8 ft centres. The screen should project at least 18 in beyond the outside of the bed in order to keep off draughts and also to allow space for a chair or bedside table, without interrupting corridor or gangway space. The main gangway must not be less than 5 ft wide between ends of screens, or the screen end and the outside wall. The space between the feet of beds opposite one another should be a minimum of 5 ft, and preferably 7 ft. A good spacing for the fixed division screens is 21 ft.

A further development of ward planning, also dependent on the parallel bed basis, is shown in Figure 4. This lay-out is slightly more easy to supervise and the distance from the ward doors to the farthest bed is considerably reduced as compared with the wards of Figure 3 or the type of plan in Figure 2. Such a plan may have great advantages on sites where ward lengths have to be restricted, but there is less privacy than in the types shown in Figure 3.

The floor span involved in a plan having four rows of beds is somewhat large and may consequently be uneconomical in many schemes. The aspect necessary is an axis from north to south, with the auxiliary rooms and ward entrances on the north wall. A solarium may be added on part or the whole width of the south wall. A difficulty with this type is the reduction of floor area per bed (in a 16-bed ward, as Figure 4) to about $81\frac{1}{4}$ sq. ft., which necessitates a ward height of 12 ft to provide 1,000 cu. ft. of air space per patient.

The divisions or screens between bed-heads should be solid, partially glazed, of wood or metal. Curtains as main divisions are not desirable. It is usual to have the upper part of the screens glazed in order to assist supervision; this glazing should be high enough to screen the heads of patients when half-sitting up. The screens are often kept 6 or 9 in clear of the floor to assist floor cleaning and to prevent stagnation of air. The overall height from the floor need not be more than 6 ft 6 in or 7 ft. Rods to carry curtains may easily be fixed at the top of the screens to eliminate the use of portable screens for the isolation of any particular bed.

Window areas in the old type of ward were generally about 1 sq. ft. to every 5 or 6 sq. ft. of floor space; in Type B this may be increased, if thought desirable, to as much as 1 sq. ft. of window to every 2 or 3 sq. ft. of floor space.

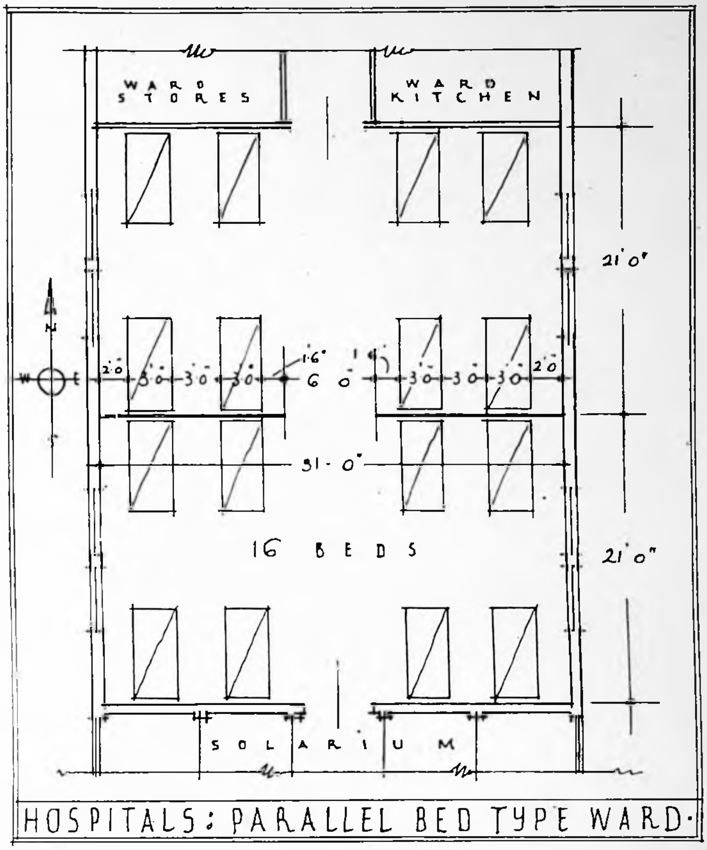


Figure 4

The sill should be about 2 ft above the floor level; the latter provision permits patients to obtain some view from the windows while in bed. The heads of windows should reach to the ceiling. Probably the most satisfactory type of window is the double-hung sash with a hopper ventilator at the top. A hinged and glazed draught shield fixed to the sill allows the bottom sash to be opened without discomfort to the patients. Sills should be either plate-glass slabs or polished hardwood. An alternative is a somewhat similar type constructed in steel, with horizontal centre-hung opening sections.

The walls of wards are sometimes tiled to a height of 5 ft, above which it is usual to paint or enamel on hard plaster. Floors are generally finished with teak or other hardwood boarding. Doors should provide a clear opening of at least 3 ft 4 in; 4 ft is more satisfactory when handling beds or stretchers. It is now general to make doors of flush type and of hardwood with a glass inspection panel. All finishes should be smooth and rounded wherever possible to avoid retention of dirt and dust. Skirtings and cornices should be coved and mouldings should be avoided as much as possible. One or two lavatory basins should be provided in each large ward.

Wards should be cut off from staircases and other means of main access by cross-ventilated lobbies or passages to ensure isolation and to reduce noise. Surgical and medical wards, as far as general lay-out is concerned, are planned alike. Each department should be grouped together and not in sexes, as the medical and nursing staff are in departments and are not usually allocated according to the sex of the patients.

Single-bed wards attached to main wards for special cases should not be less than 11 ft by 15 ft, while paying patients' single wards are generally at least 180 sq. ft. The size of beds used varies considerably in different hospitals. Some use beds only 2 ft 6 in wide, while others use beds up to 3 ft 6 in wide, the most general being, however, 3 ft. The length is generally 6 ft 6 in.

Ward heating is generally by means of radiators placed under the windows or, if cost will permit, panel heating. The latter system is, no doubt, a great aid to cleanliness, as pipes may be hidden more easily and also the heads of the beds are not close to radiators. An alternative method sometimes adopted is the use of continuous heating pipes without radiators on each side of the wards. Open fires are pleasant in appearance and attractive to patients, especially if day rooms are not provided, but their use has decreased.

Bed-head lights, which are being increasingly used in hospitals, may be fixed to the screens and the wiring leads included in their construction.

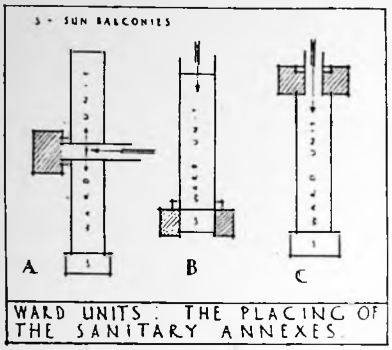


Figure 5

Individual bed-head lights do away with the unpleasant necessity of patients having to look towards ceiling pendants placed centrally in the ward.

A call system connecting each bed to the duty room or ward kitchen is desirable, at least for those beds having their heads towards the duty room ; at present, call systems are not a very general provision in this country, although such an installation is quite usual equipment in America.

Children's Wards—Cots used in children's wards are usually about 4 ft 4 in long and 2 ft 2 in wide, the usual allowance for floor space being 50 sq. ft. for infants and 75 sq. ft. for children. In other respects these wards are similar to the general wards except they are usually decorated in a manner suitable to the age of the patients. It is probable that several small wards are better for children than one large one as the noise of one fractious child then only disturbs a few other children.

The number of beds per ward varies very considerably ; some authorities suggest that wards should be confined to four beds, others to eight beds and even more.

Nurses' Sick Bay—A small ward for this purpose is generally required in the main building. Attached to this ward it is usual to have a bathroom, lavatory, W.C., and a small ward kitchen with a gas stove, food store, etc. A very small sink room is a very useful addition.

Ward Services—One of the fundamental decisions to be made when planning the ward units is the placing of the sanitary annexes, and Figure 5 illustrates three common positions for these annexes in relation to the wards. Type A shows the sanitary units placed in the centre of the ward unit and Type B shows them at the end farthest from the main entrance to the ward. Arrangement B is difficult from the point of view of the nursing staff, who have to walk the length of the ward to reach the sink room. Further objections to this placing are that the south light is cut off from the ward windows and the sun balcony is shut in and restricted.

Type C places the sanitary accommodation at the entrance to the large ward and seems the most satisfactory arrangement, especially from the point of view of any single-bed wards which may have to be provided ; the staff may, in this type, reach the annexes without crossing the main ward. Care should be taken in all types to avoid placing entrances to sanitary blocks so as to incommode a particular bed. Figure 6 (top) shows a good method of entrance to the sanitary service rooms by the use of the main corridor, but it shows the drawback of having a bed in the corner of a ward which may be in a draught and has light on one side only, though these difficulties can be overcome by placing a window in the corner and allowing rather more space between the bed and the end wall of the ward. Figure 6 (bottom) shows a bad arrangement which inconveniences two beds very badly if the usual bed spacing is kept and at the same time the annexe cuts off valuable light and free circulation of air from two ward windows.

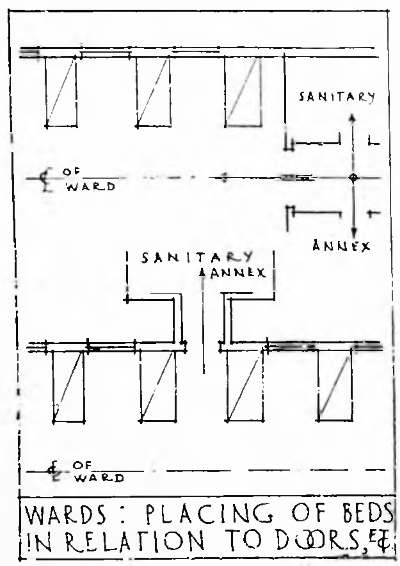


Figure 6

There is much controversy as to the necessity for the provision of ventilated "cut-off" lobbies between the wards and the sanitary annexes, although with improved plumbing and fittings the need seems greatly diminished. In many of the hospitals constructed recently in this country and in the majority of those in America, the special lobbies have been omitted and corridors have been used for this purpose ; in any case, no sanitary services other than lavatories should be entered directly from the wards. It is also more satisfactory if all the services are grouped together, including the ward kitchen, etc. It is usual to group the w.c.'s and sink room together and the lavatories and bathroom.

Two W.C.s are usually provided in each main ward unit ; they should be at least 5 ft long and 2 ft 9 in wide, and the doors should be hung to open outwards.

Two lavatory basins, with the possible addition of another in the bathroom, are usual in each ward unit ; these are more pleasant and provide greater privacy if placed in separate compartments or cubicles. In the patients' lavatory, space is frequently provided for a portable bath, with facilities for filling and emptying it. One bathroom is usually sufficient for each large ward with its special wards, but additional bathrooms are sometimes required for special wards. In the surgical department, bathrooms should be at least 9 ft by 8 ft, with the bath placed away from the walls and with the head facing a window.

Sink Rooms—These rooms, often referred to as "sluice rooms" should be placed adjoining but not opening directly out of the main wards, and should be at least 10 ft by 8 ft, and here, again, with improved fittings and plumbing, it is generally considered unnecessary to provide a ventilated cut-off passage. The sink room has to contain the following fittings : A slop sink for washing bedpans, etc., with a draining-board placed sufficiently high to make stooping unnecessary, or one of the newer bedpan washers ; a steeping sink for soiled linen ; a large fireclay sink with scrubbing slab for cleaning mackintoshes and a rack over for drying them ; a heated bedpan airing chamber with rack made of hardwood slats for storage ; a tile-lined cupboard, ventilated to the open air for fæces and urine awaiting examination (this fitting is sometimes placed in the test room) and a heated towel-rail. Some hospitals provide a small gas incinerator for ward rubbish and all generally require an open-air or well-ventilated balcony for refuse bins near the sink room and ward kitchen.

A nurses' lavatory and W.C. are generally needed and these are sometimes entered from the sink room, but are better separated by a lobby.

Sterilising Room — In many hospitals this room is combined with the test room and, when separated, it is convenient that they should adjoin. A very small room is required ; two small sterilisers are usually provided, one for instruments and one for bowls, etc., together with a sink.

Store Room—This is usually a small room for storage of bed-rests, bed-tables, spare furniture and sometimes, if other accommodation is not provided, numbered lockers for storage of patients' own clothing or other property.

Linen Room—This room should be fitted with cupboards having slatted shelves with the slats at right angles to the walls. All cupboards should be ventilated at the top and bottom. Doors should be of the sliding type. Heating flow and return pipes should be carried through all compartments

as a necessary provision for drying and airing.

Ward Kitchen—This room should be not less than about 16 ft by 14 ft. It should contain a properly ventilated larder, although this has, in some hospitals, been partially replaced by the use of refrigerators. The other necessary equipment is a sink with adequate draining-boards, a hot-water boiler, a gas or electric stove (with a toaster) for simple cooking, a dresser and a plate rack. A hood, having an extract ventilator, should be provided over the cooker. Doors must be made wide enough for food trolleys to be able to pass through easily, that is, at least 3 ft in the clear.

Ward Maid—This room should contain a slop sink, draw-off taps for pails, racks and storage for necessary articles such as soap, dusters, brooms, brushes and pails. A room 8 ft by 5 ft is sufficiently large. If coal fires are provided, coal boxes on wheels are often kept in this room.

Duty Room—Opinions as to the necessity of providing duty or sisters' rooms vary greatly, but the provision of some facilities for quiet for the sisters seems desirable for the writing up of record sheets or reports. In some hospitals the clinical or test room is used for this purpose and in others a writing desk is placed in the ward kitchen. When a duty room is provided it should be about 12 ft by 8 ft.

Test Room—The test room, for the use of the medical staff, should be small, well lighted and about 10 ft by 12 ft. It should contain a bench in the window for microscope work, a sink and cupboards with shelves for test and stock bottles, with an air-tight instrument compartment.

Solaria—Opinion as to the necessity of providing balconies or solaria attached to general hospital wards varies much; many hospitals provide neither, others provide one or other and even both. The solarium forms a ward sitting-room for convalescent patients; it permits of a slight change or surroundings and makes conversation and recreation among patients more easy. Some authorities dislike balconies, it is maintained they cut off too much light from wards. Solaria and balconies must be at least 9 ft wide for adult patients, but this may be reduced to 7 ft 6 in for children or infants' cots.

Figure 7 illustrates three typical solaria at the ends of wards. Generally it is necessary to combine the ward fire escape, from upper floor wards, with the solarium and the planning of these staircases is the chief difference between the three diagrams shown. The scheme shown in Type A has the staircase enclosed and forming part of the solarium. Type B has the staircase separated from the solarium, which involves the loss of one bed in the ward and necessitates an open staircase in order not to cut off light from the ward. Type C has the staircase adjoining the solarium, but separate from it and approached through a cut-off lobby from the ward. Care must be taken to remove water from balconies and steps should be avoided as much as possible. Movable glazed screens should be provided to protect patients from rain or cold winds.

A small balcony for the use of walking patients, as shown on the diagram, is a pleasant addition to the solarium.

There is a general tendency to move the sanitary annex from the south ends of wards and group it with other auxiliary rooms, thus leaving the southern ends of the north and south axis type of wards free for sun balconies or solaria and in east and west axis types the solaria may be placed at the end, which avoids continuous balconies along the south (and main window wall) side of wards, which some authorities criticise. Too much direct sunlight does, however, seem undesirable from the patients' point of view, and balconies do to some extent act as sun blinds in the hottest part of the day.

Circulations Generally—Main staircases should be at least 4 ft wide; the "going" should not be steeper than 6 in by 10½ in and no winders should be used. Corridors should be at least 6 ft wide so that stretchers, trolleys, etc., may be turned easily into side doorways. Bed lifts are only required when wards are on more than one floor and only one is required if all wards are connected on each level. Lifts in staircase wells should be totally enclosed, preferably by wired glass panels, on a light framework. Bed lifts should never be less than 7 ft 6 in by 4 ft, and an additional foot in each direction is advisable.

MATERNITY UNIT

Wards—Floor space of about 100 sq. ft. is the minimum per bed that should be provided in maternity wards, but 120 sq. ft. per bed is more satisfactory, as cots may have to be placed at the side or the end of the mothers' beds. There is much to be said in favour of sub-dividing a maternity ward into bays, accommodating four beds each, by means of glazed screens about 6 ft 6 in high.

Some hospitals do not have large maternity wards but are planned with small wards for two, four or six patients each.

Maternity Cubicles—These cubicles, if they are to be soundproof, must be in the form of single-bed wards. Many methods of sound-proofing may be adopted such as brick-on-edge, with quilting or wall board on each side, or two thicknesses of gypsum block or studding with quilting between. In all cases the partition must be insulated as far as possible from the floor, walls and ceiling. At the floors

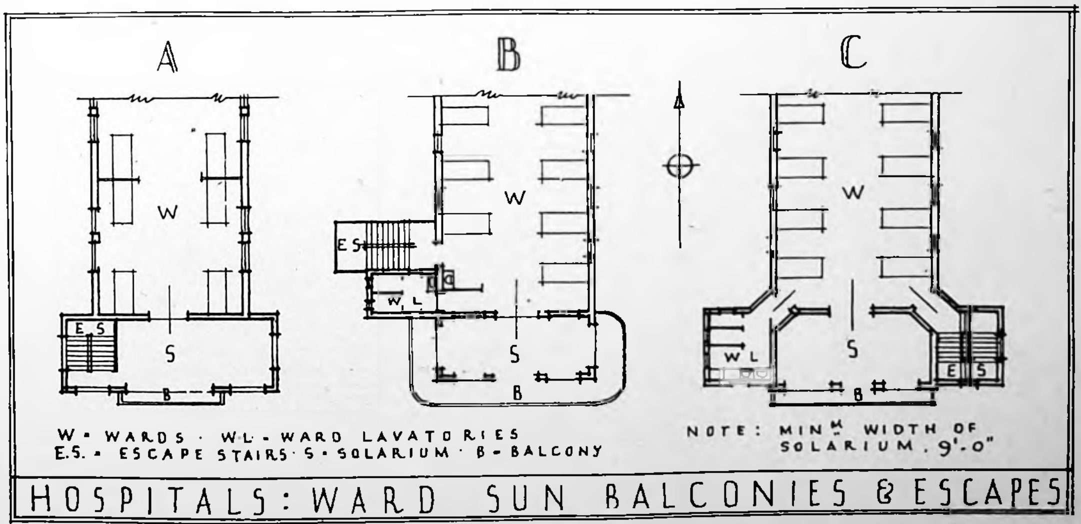


Figure 7

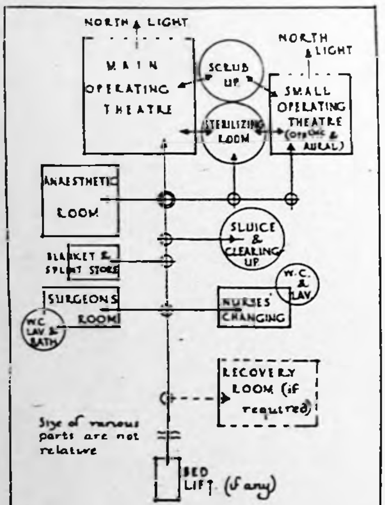
compressed cork may be used, and caulking with quilt is useful at other junctions with the main structure.

Labour Room—The labour room should have an area of at least 196 super ft (14 ft by 14 ft), but it is preferable if 250 sq. ft. can be allowed. A lavatory basin and sink should be provided and placed, if possible, near a proper sink (or sluice) room. The labour room should be isolated from all wards and be sound-proofed ; a sterilising room should, if possible, adjoin. At least two labour rooms are necessary unless soundproof single wards are available.

Night Nursery — A floor space allowance of 50 to 60 sq. ft. per cot should be made for the night nursery. The mothers should be protected against noise from the nursery as much as possible.

Babies' Bathroom — This room should adjoin the nursery. It need not be large, as it only has to accommodate two special bath fittings, either side-by-side against a wall or back-to-back in the centre of the room, the latter being probably the more satisfactory arrangement. An area of about 100 to 150 sq. ft. is sufficient.

Duty Room—This room may be used as the ward kitchen and should be planned in a manner similar to that described for the duty room for main wards ; the milk larder should, therefore, adjoin the duty room to facilitate service to the nursery.



OPERATIONS UNIT : ANALYSIS DIAGRAM OF GENERAL LAY-OUT.

Figure 8

Sterilising Room—A sterilising room to serve the labour room should be provided. At least 80 sq. ft. in area, to accommodate two sterilisers, a sink, and cupboards.

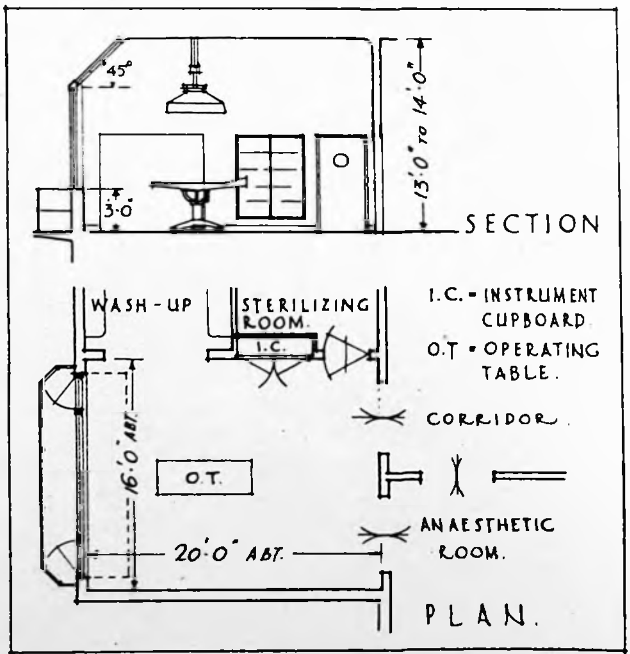
Other Services — The remaining services, such as clinic room and lavatories, should be similar to those provided for the other ward units.

OPERATING THEATRE UNIT

Equipment for this unit varies so much according to the requirements of each hospital that a general guide only can be given. This unit should have easy access from the surgical and ophthalmic wards, but at the same time it should have quiet and privacy. If possible, it should be isolated from the main circulation of the hospital by a ventilated lobby. The aspect should provide the maximum of north light. Corridor widths within the unit should be not less than 7 ft.

Figure 8 illustrates an analysis of the circulation within the unit and the relation of its various parts. It should be noticed that some difficulties may arise in using one anæsthetic room for the two theatres.

The Theatres — Main theatres should have a floor area of from at least 300 to 350 sq. ft. and a height of 13 to 14 ft. Small theatres should be at least 250 sq. ft. Opinions vary as to the necessity of providing top-light in addition to the normal large north windows, as so many operations are now performed entirely by artificial light, even during the hours of daylight. If, however, top-light is provided, it is usually at an angle of 45 degrees and should be equipped with external water sprays for cooling in hot weather. Windows should be practically the full width of the room and extend from about 3 ft above the floor to the ceiling. It is general to have a large fixed centre-light with a side-hung casement on each side. They should be of metal or wood with rounded sections with as few projections as possible. The vertical glazing should be of opal translucent glass, and an external balcony with external access should be provided for window cleaning. Some authorities recommend that the floor should be laid with falls to a channel and a special gully ; but a sloping floor tends to cause difficulty with such fitments as movable instrument tables. The floors and walls should be of impervious materials, such as terrazzo or tiles and with the surfaces as continuous as possible. Instrument-cases with clear-glazed doors should be built into and flush with the walls and should be air-tight. Heating and ventilation are important services. In many recently constructed theatres a combined system, such as plenum has been installed, so that all air used is washed and warmed, or cooled before entering the theatre. Panel heating or flush panel radiators are excellent, as cleaning is then made easy ; but if ordinary column radiators are used, they should be hinged to swing out from the walls for cleaning purposes. Forced air-extract ventilation is generally provided and all incoming air must be filtered. The doors to the theatre should be at least 4 ft wide in the clear. Theatres should be capable of being darkened and the blinds for this purpose are generally arranged on the outside of the windows. Figure 9 illustrates a typical plan and section of an operating theatre. Lavatory basins for the surgeons and nurses and an emergency



OPERATING THEATRE : A TYPICAL PLAN & SECTION.

Figure 9

sink are not shown in the actual theatre, but there is now a tendency for these fittings to be placed in the theatre, from which they have, in the past, been removed to the wash-up. The provision of these fittings in the theatre certainly may assist in the prevention of any loss of time on the part of a surgeon when operating.

Anæsthetic Rooms—These rooms have to be available for all theatres, and therefore the usual practice of making this room open directly into each theatre is almost impossible. The room should have an area of at least 120 sq. ft. It should be equipped with a lavatory basin and an air-tight cupboard for apparatus. Good ventilation is essential and also good natural light.

Sterilising Room — This room should have an area of at least 200 sq. ft. It should adjoin the theatres, but is probably better if it does not open directly out of them. Some designers provide a hatch connection between the sterilising room and the theatre through which requirements may be passed, thus avoiding the passage of steam-laden air into the operating theatre.

The apparatus consists of a sink, steam sterilisers, glass shelves and glass-fronted cupboards for storage of bandages, swabs, sponges, etc. Adequate provision must be made to remove steam from the room.

Scrub-up Room (Wash-up) — Wash-up facilities for the theatre should be provided either in or adjoining the theatre itself, preferably in a recess off the theatre or in a separate room. The two former arrangements are probably the most satisfactory, so that the surgeon need not go out of the theatre for his final wash before operating. A space of about 140 sq. ft. should be allowed. The equipment consists of lavatory basins and large sinks with open wastes to floor channels, adjoining which should be placed porcelain or teak slabs upon which instruments may be placed. Glass shelves are usually placed over the sinks.

Surgeons' Room—This room, with its bathroom and W.C., may be placed almost anywhere within the unit and is used for changing purposes. The bath and W.C. should be separate.

Nurses' Changing Room — This room is similar to that provided for the surgeons, but a bath is not always installed. Lavatory basins should be provided, and also a W.C.

Sluice and Clearing-up—A small room for general cleaning requirements of the unit and for storage of cleaning equipment, to avoid the general theatre wash-up being used for these purposes.

Additional Accommodation — A small recovery room is sometimes needed in conjunction with the theatre, in which one or two beds may be

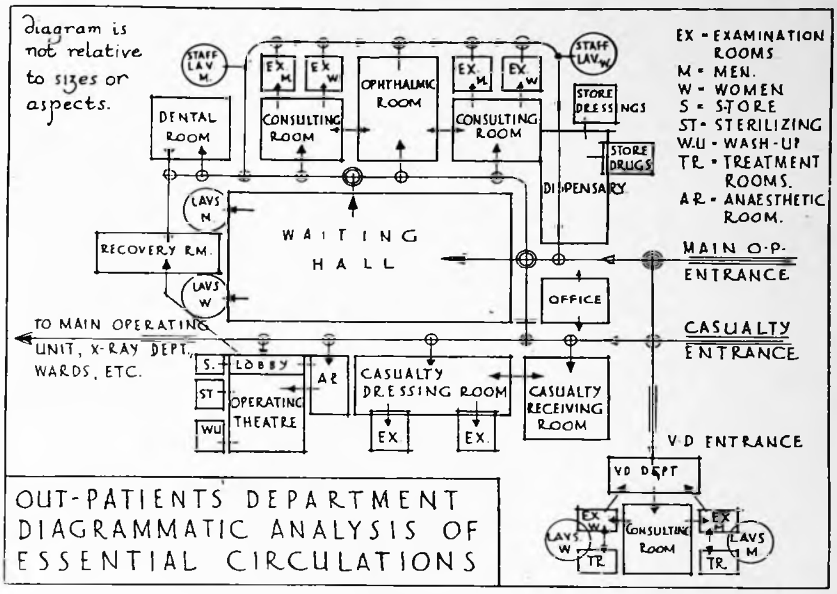


Figure 10

placed. Storage rooms are necessary for blankets, splints, plaster dressings, etc.

PATHOLOGICAL DEPARTMENT

As this department is used only by the medical staff it is generally placed in the administration block, but it should have easy access from the wards, the theatres and from the out-patients' department. For a normal-sized hospital unless much work is done on behalf of local practitioners, a laboratory having a floor area of 300 sq. ft. is usually adequate, together with a small office of about 120 sq. ft. The laboratory is usually equipped with teak-topped benches with cupboards and drawers under, in front of large windows, preferably with north light. The benches should be equipped with small sinks, water, gas and electricity. Other equipment needed is a shelf for incubators, a lavatory basin and cupboards for books and apparatus.

OUT-PATIENTS' DEPARTMENT

It is impossible to give accurate information regarding the sizes of many of the important rooms without knowing the probable number of out-patients to be accommodated. The department should be separated from but connected by covered or one-story access to the main hospital. Out-patients must be able to enter and leave without using the main hospital circulations.

Figure 10 shows a diagrammatic analysis of the essential circulations in the out-patients' department. It is helpful if patients do not re-enter the waiting hall after examination by the doctors, but leave the building by a separate way passing the dispensary, so that medicines, if required, may be collected on the way out. An additional small waiting hall attached to the dispensary is desirable in large departments.

The casualty department, although part of this out-patient unit and using to some extent the same services, should be separated as much as possible and, in some hospital schemes, becomes an independent unit.

The registration clerk's office should adjoin the entrance and should have plenty of space for records. A room of about 80 to 100 sq. ft. is probably adequate.

Waiting Hall—The waiting hall should provide ample seating accommodation for the numbers likely to use the department at any one time. Fixed benches are generally used and the room should be light and well ventilated. It will probably have to be top-lit, and advantage of this should be taken to extend its height, say to 15 ft above that of the other sections of the out-patients' department, which should be about 10 ft. in height. Lavatory requirements for persons waiting should be at least two basins and two W.C.s for each sex. This accommodation should open off the waiting hall to facilitate control of its use by the staff. If patients may have to wait for long periods a useful addition is a small refreshment counter, while a drinking fountain is generally considered essential.

Casualty Receiving Room—This room should be near a special casualties entrance, which should be well placed to provide easy "draw-up" for ambulances and should have an area of about 200 sq. ft.

There should be the minimum number of steps at the entrance, to reduce the difficulty of carrying stretchers. The room should be fitted with a sink and lavatory basin, to which may be added a fireclay slab and sprays, which will be about 6 ft 6 in by 2 ft. Easy access to the X-ray department is essential.

Casualty Dressing and Examination Room—This room should have an area of about 350 sq. ft., with at least two cubicles 8 ft by 6 ft, or larger, leading directly from it. Adjoining the room should be a store for dressings, splints, bandages, etc. A sink and lavatory basin are needed in the main room.

Minor Theatre—This theatre should have an area of at least 250 sq. ft. and should be planned and equipped in much the same way as the theatres attached to the main hospital, but in a manner adapted for minor general operations. Wash-up facilities in the form of lavatory basins and a sink may be in the theatre, but a separate small sterilising room should be arranged directly adjoining. The anæsthetic room should lead into the theatre by means of wide doors, and have an area of at least 80 sq. ft. Rooms for nurses and doctors, with lavatory accommodation, are desirable.

Recovery Room—This room is used for the resting of patients after dental and minor operations and should therefore be readily accessible from both departments. To accommodate 12 folding benches it should have an area of at least 600 sq. ft. and at least two lavatory basins should be provided. It is also desirable that a W.C. should be provided for each sex. Sometimes separate recovery rooms are provided for each sex when the W.C.s should be attached to each group for one sex only.

Consulting Rooms — These rooms are required to be easily and directly accessible from the main waiting hall. General consulting rooms should have an area of about 200 sq. ft. each; good light, ventilation and heating are essential. The examination and dressing rooms should be at least 10 ft long by 6 ft wide; two rooms attached to each consulting room is a minimum and three should be provided if possible. A lavatory basin is needed in each examination room.

The examination rooms are used as dressing rooms and the patient, after dressing, should not have to return through the consulting rooms, nor should the way out pass through the main waiting room, but should be arranged on a special circulation.

Ophthalmic Room—A room at least 24 ft by 10 ft is needed as eye tests require a length of 21 ft. The room must be capable of being darkened and must be accessible from the consulting rooms without re-entering the waiting hall. It is probable that the numbers using this room in a normal hospital scheme will not warrant the provision of separate examination cubicles, a requirement that sometimes has to be met in large eye departments.

Dental Room—North light is desirable. A room having an area of 150 sq. ft. is sufficient if a single chair is provided and at least 100 superficial ft per chair if more than one is provided. A lavatory basin is needed for each chair, as well as the usual water supplies attached to the operating chair; gas, air and electricity points are also required for this room. A small workshop is usually provided in connection with the dental room, with a working bench and ample store cupboards.

Dispensary—The size of the dispensary is again very dependent on the possible daily number of patients, but it is probable that a floor area of about 250 to 400 sq. ft. will be needed. The addition of about 200 sq. ft. will be required for the drug store and about 100 sq. ft. for the dressings store. Out-patients are served in a special waiting space through hatches over a counter, but the dispensary is also used for in patients, whose supplies are taken to the wards by porters or the nurses. Side-light is desirable. A small office for book-keeping and records is also useful. The room should be fitted in the manner of a laboratory, with shelves and cupboards round the walls and a bench for balances and other apparatus and should be provided with at least two sinks. The floors in this room and the drug store are usually laid with acid-proof materials. Shelves should not be more than 7 ft above the floor and hatches to the waiting hall should be about 1 ft 6 in wide. Convenience of access for the delivery of bulk supplies is desirable. The drug and dressing stores are usually fitted with drawers and shelves similar to the dispensary, and an additional space is required in the drug store for bottle hampers.

X-RAY AND ELECTRICAL DEPARTMENT

General—This department is generally used equally by both in- and out-patients, and should therefore be suitably placed in relation to both sections. A machine room constructed to isolate all noise-producing apparatus, motor generator, if required, rotary converters and transformers and separate switch and meter rooms must be provided. These should, if possible, be placed in a basement, but if it is necessary to accommodate the apparatus on the same floor, it should be entirely cut off by soundproof walls and doors.

X-ray Room—This room should be at least 350 sq. ft. in area and about 11 ft high. The main apparatus is generally fixed to the ceiling. Efficient ventilation by means of fans is essential and the room should be as near as possible to the machine room, for it is here that high voltages are required. The windows of this room should be ample for the daylight operation of X-ray photography, but they must be capable of being darkened with light-proof blinds for fluorescent screen examinations.

Dark Room—An area of about 150 sq. ft. is needed for the dark room, which should be approached from the X-ray room through a light-lock lobby without doors. A bench 3 ft wide with a sink and tanks is required for developing work and should be placed on one side with a bench for dry work on the other side. Artificial ventilation should be provided by means of ducts and extract fans.

Film Store—A floor space of about 100 sq. ft. should be allowed. This room must be kept dry and warm by means of heating pipes and must be well ventilated and fireproof and include fireproof doors; it may open out of the X-ray room directly, or off a cut-off lobby. A separate building is sometimes provided where the stock is large.

Deep-therapy — If only one apparatus is required a floor space of at least 15 ft by 20 ft is needed for this room. As in the case of the radiographical room, the height should be about 11 ft. It is usual also to arrange for this room as near as possible to the machine room, transformers, etc., as here, again, high voltages are required. A cut-off lobby from the general circulation is generally arranged.

Light Room (Treatment)—Cubicles about 7 ft by 10 ft are required for treatment and each should, if possible, have a separate window. Cubicles can be arranged on one or more sides of the room for remedial treatment by means of special apparatus. This room should be well lit and have ample floor space and at least two clear walls for the fixing of apparatus. A lavatory basin should be provided, and a foot-bath is sometimes added.

Other Rooms—A view room attached to the radiographical section is sometimes provided. There should be a radiologist's room and/or consulting room, for the additional efficiency of the department. A small waiting room attached to the electrical treatment and massage room may also be needed. Changing rooms for the staff of the massage room are also desirable.

A lavatory for doctors is desirable with also a women's lavatory for the nurse and sister in attendance, especially if the radio-electrical department is at any distance from the main out-patients' department.

Special Construction—Certain special requirements arise with regard to the rooms used for X-rays, deep and

superficial therapy, where the penetration of rays must be avoided. The walls of these rooms should be insulated by a lining of lead (7 lb), or as this method is expensive, could be constructed of, or lined with, barium sulphate blocks at least 3 in thick and covered on both sides with at least ½-in of barium plaster Similar protection should be provided for floors and ceilings if rooms in constant use are placed above or below the radiological rooms. The doors to these rooms must also be insulated with lead, usually in two layers (6 lb each); the doors are thus made abnormally heavy and should be provided with quadrant floor tracks.

VENEREAL DEPARTMENT

General—It is usual for the V.D. department to be planned so as to be separate from the general out-patients' department and with its own entrance. The main waiting hall of the out-patients' department is sometimes used by the V.D. patients, but it is usual to provide small waiting rooms for each sex, opening from a waiting hall forming part of the department.

Consulting Room—Should have an area of about 180 sq. ft. and be equipped with a sink and lavatory basin. Attached to this room should be one or two small dressing rooms for each sex, about 8 ft by 6 ft, each having a small urinal basin. If possible exit from a consultation should be from the dressing rooms and not back through the consulting room.

Treatment Rooms—These rooms, one for each sex, should be close to the consulting room and should have an area of about 170 sq. ft. At one end should be placed two sinks and a lavatory basin and also shelving for bottles.

Irrigation Rooms—These rooms are required for both sexes and should be placed near the consulting rooms. The room for men should be about 15 ft wide and sufficiently long to provide the required number of irrigation stalls with sufficient circulation space round them. The room is arranged with the stalls in the centre and space behind for the doctors to pass up and down. The stall divisions may be either terrazzo or fireclay slabs or metal; they are usually about 6 ft 6 in high and spaced at 3-ft centres. A continuous fireclay trough is placed 2 ft 4 in above the floor along one end of the stalls, while curtains are placed at the back for privacy. One or two sitz baths or bidets should be placed against the side walls, together with a sink and lavatory basin. The walls should be tiled or treated with some impervious material to a height of at least 5 ft 6 in, and should be continuous with the floor finish. The room for women is usually about 120 superficial ft, with the floor and walls treated as in the men's room. A metal-covered table or trolley is usual for irrigation purposes. Sitz baths, etc., are required and also dressing boxes.

A small rest room is generally necessary. A store for dressings and staff lavatory accommodation may be needed if the department is separated from the rest of the out-patients' accommodation.

ADMINISTRATION BLOCK

General—The administration block may be roughly divided into four general sections. Part A may consist mainly of office accommodation for various administrators such as the secretary and matron, together with a board room and a clinical laboratory. Part B provides living accommodation for house surgeons, matron, maids and sick nurses. Part C may provide for the dining-rooms, storage, and service of food and includes the kitchens. Part D may provide general storage and linen rooms. Part A must be placed near the main entrance, as persons from outside the hospital need ready access to these rooms without disturbing the general internal working of the hospital. Part B can be placed away from the entrance and on upper floors if desired. Part C has to be situated for easy service of deliveries from the town, and at the same time must have easy and rapid access to the wards for the serving of meals; the dining-rooms may be grouped, some with direct connections, with the kitchens. Part D should be related to the laundry and the main users of linen, such as the wards.

Inquiry Office—This room should provide space for switchboards of telephone systems, which usually incorporate the fire-alarm system and must be easily visible on entering the building. It is general to have two telephone systems, one for internal use between all departments of the hospital, and the other, the post-office system with extensions to all departments, such as the offices, kitchens and casualty departments, which may need direct communication outside the building.

Board Room—If required, this room should have floor space of about 22 sq. ft. per person, so as to allow of comfortable chair spacing and adequate circulation space. Each member should be allotted about 2 ft 6 in run of table.

Matron's Office—The matron's office should be placed near the entrance and as centrally as possible in relation to all departments of the hospital. The room should have an area of at least 200 sq. ft.

Honorary Staff Room—The honorary staff room is used by the medical officers who are not resident in the hospital but make daily or occasional visits. The room should be a fairly large one, so that it may be used for medical consultations and meetings. An area of at least 300 sq. ft. should be allowed. Directly attached to this room should be placed a lavatory and lockers for the visiting staff. This room is frequently equipped as a medical library for the use of the staff, both visiting and resident. It may be placed on the ground floor and have easy communication with the wards and operating theatre.

Almoner's Room—A fairly large area is generally needed, as considerable filing space for records is often required, as well as space for interviewing patients or their relatives. A minimum area of 150 sq. ft. should be provided and, preferably much more, especially if charities run on behalf of the hospital are managed and organised by the almoner.

Cloakrooms—The cloakrooms and lavatories must have a suitable area for the use of members of the board, those having offices in the building, visitors and any waiting public.

House Surgeons' Quarters—It is desirable for these rooms to be placed in such a position as to provide very easy and rapid access to the casualty rooms and the wards. They are generally placed on the ground floor, usually the most satisfactory situation for access to patients and the clinical laboratory. Also, since house surgeons may be the only male resident staff, it is more satisfactory to separate them from other residential quarters. It should be noted, however, that few hospitals make provision for house surgeons of both sexes and only one sitting-room, bathroom and W.C. are generally provided.

The sitting-room should have ample space, as it is to be used by several persons who deserve the maximum of comfort during the few spare hours possible to them, and therefore an area of about 300 sq. ft. is suggested. Often the room is made large enough to accommodate a billiard-table.

The bedrooms may also be required for quiet study, which is generally impossible in a common sitting-room, and therefore an area of 180 sq. ft. is advisable. The bathroom, W.C., store and box-room should be so arranged that they adjoin the bedrooms and can be reached preferably without entering main corridor circulations.

Matron's Quarters—The matron's quarters are often separated from the matron's office and this is probably more satisfactory than if they are arranged together. The matron's flat is frequently on the first floor of the building.

The sitting-room should have an area of at least 200 sq. ft., as meals may be served in this room and the matron may have guests. Two bedrooms may be needed, about 150 and 120 sq. ft. in area. As in the house surgeon's quarters, the bathroom and

W.C. should be accessible without entering the corridor, thus forming a self-contained flat.

Dining-rooms—The dining-rooms should be given a pleasant outlook and, although aspect is not of primary importance, sun at some time during the day is an advantage. The largest room should, if possible, be connected to the service pantry on its long side. Tables should not be too long and should be at right angles to the wall in which the service doors are placed. Each person requires about 2 ft 6 in of table length and gangways should be 3 ft wide between backs of chairs and 4 ft wide round the walls. Two doors should be provided between the room and the service room to separate "in" and "out" traffic. Frequently sisters are placed in a separate bay or alcove rather than at one of the tables in the dining-room.

House Surgeons' Dining-room—A room of about 200 sq. ft. in area is usually sufficient. It should be placed in such a situation that it may be served rapidly, but at the same time it should be quiet.

Nurses' Dining-room—A floor area of at least 10 sq. ft. per person should be allowed for the probable average number of nurses who may be using the room at any one time. The number is usually a few more than half the number of nurses. It seldom happens that more than half the nursing staff can be present at any one time and allowances must be made for those on duty, the night staff, and those who are away owing to off-duty time ; it may be necessary on rare occasions for 75 per cent of the staff to be accommodated.

Cloakrooms—Cloakrooms and lavatories placed near the nurses' dining-room, are desirable when the nurses' home is in a detached building.

Maids' Dining-room—The room may be based on an allowance of 10 sq. ft. per person in a similar way to the nurses except that a larger proportion will need serving at the same time ; the area should be based on 75 per cent of the staff.

Service Pantries—The most important service pantry should adjoin the kitchen and be served directly from the kitchen hotplate, while the smaller pantries which may be required should be served from the main one by suitable corridor connections. Cross circulation should be reduced to a minimum, although a certain amount can seldom be avoided. All doors must be wide enough to allow food trolleys to pass easily. The pantry for ward service should be directly attached to the main kitchen and the wash-ups and must have room for service preparation and ample storage space for a number of food trolleys.

Kitchen and Stores—The kitchen, together with its various preparation and storage rooms, must be placed in such a position that the distances to all departments requiring kitchen service are reduced to a minimum and so that a service road and entrance for deliveries from the town may be arranged easily.

The main kitchen may be placed on the ground or an upper floor, the latter often being more satisfactory as the whole department, with the dining-rooms, tends to become more compact. It is sometimes possible to arrange the delivery and bulk storage rooms on the lower floor with the main kitchen above, and it is also possible to place most of the dining-rooms with the other rooms suggested on the ground floor, thus giving a very easy vertical communication by means of lifts from the kitchen to the service pantries. The proper placing of the larders, stores and pantries in relation to the kitchen is of the utmost importance to ensure a proper sequence of operation from delivery to service in any particular service pantry. Figure 11 illustrates in diagrammatic form the main circulations required.

Kitchen—The kitchen should have good light and ventilation. Top-light in addition to some side light is desirable, as it leaves the maximum wall area clear for apparatus. The most satisfactory method of ventilation is by hoods and ducts connected to extract fans. The main kitchen will probably need a floor area of about 1,200 sq. ft. and should be a broad rectangle rather than a square in shape. The walls should be faced with glazed brick or tile for the full height of the room and the ceilings lined with glass, metal or patent sheetings for easy cleaning of greasy condensation. The finishings should be of hardwood, preferably teak. Steam, gas and electricity are the most usual fuels for modern equipment owing to their cleanliness ; each has its special uses for different purposes.

Scullery—The scullery should have direct entry from the kitchen but openings should not extend to the ceiling, so as to help in extracting odours and steam directly from the scullery without risk of their penetrating into the kitchen. Teak and galvanised sinks are required with large draining-boards of teak ; the latter should be hinged for cleaning.

Vegetable Scullery—Large sinks are needed with wastes discharging into open channels with a trap protected by a wire grating. Slate slabs and a potato peeler are also needed. Bins sufficiently large to hold daily supplies are used for the storage of vegetables.

Fish Scullery—A special fish preparation room or scullery is frequently provided. The equipment needed is a sink and slate slab.

Stores—Several store rooms are required for bulk storage of provisions, china, glass and ironmongery, and smaller stores for special purposes such as the cook's and dry stores. Shelving and bins are needed in each to suit the various types of packages to be handled.

Larders—Larders are needed for bread, fish, meat, dairy produce and a main vegetable store should also be provided. These should be very well ventilated, cool, have a northerly aspect or open into a shaded area. There should be air inlets at the floor level and extracts at the ceiling protected with wire gauze. It is general to provide refrigeration for larders, for dairy produce, meat and fish, the plant for which may be placed in the basement under the larders or in a small room adjoining them. Adequate slate and marble shelves and suitable hooks and bars for hanging meat are essential. It is general to tile the dairy produce larder and a similar finish is often used throughout.

Maids' Sitting-room—A maids' sitting-room should be near the kitchen and maids' dining-room. It should have a pleasant outlook on to the gardens if possible and a westerly aspect, as it is mainly used during the latter part of the day. The area of the room should be based on an allowance of 15 sq. ft. per person.

Housekeeper's Office—In a small hospital the housekeeper often acts

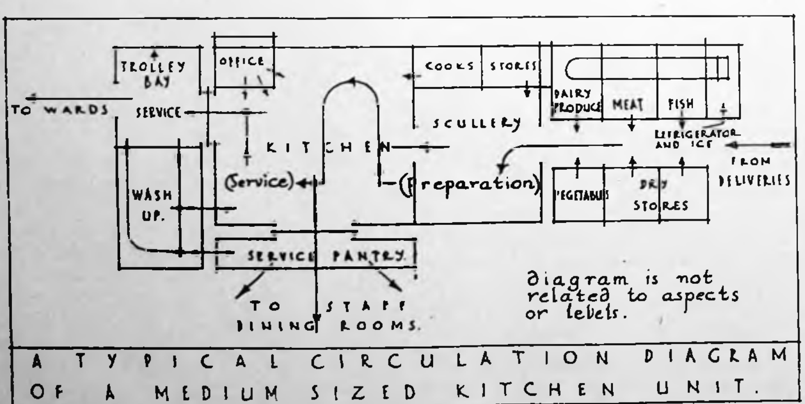


Figure 11

also as steward and therefore has the control of deliveries for the kitchen as well as of the maids and their work. The room should have an area of about 100 superficial ft.

Cloakroom and Lavatories—Near the maids' sitting- and dining-rooms should be provided cloakroom and lavatory accommodation for use during the day.

Linen Rooms—Sometimes the sewing room is used by a "guild," which is composed of townswomen; it would therefore seem wise to place this department on the ground floor and in a position easily accessible from the entrance as well as from the laundry and wards. The storage room for linen should have direct access from the sewing room and should be well warmed and ventilated. The linen is stored on shelving usually placed about 1 ft 9 in apart and about 2 ft 6 in deep, arranged in cupboards round the room. Space for a large table for sorting and examining linen is needed. The area of the room should be about 200 sq. ft., including the area occupied by cupboards and shelving.

General Stores—Ample storage space is needed for all supplies, including furniture, but excluding goods which have to be stored adjoining special departments such as the kitchen and dispensary.

Maids' Quarters—They should be conveniently placed for easy access to the kitchen and to the maids' sitting-room, which is usually placed close to the main kitchen and maids' dining-room. Sometimes these bedrooms are placed in the main building but in other schemes they form part of the nurses' home. The bedrooms should have an area of 100 sq. ft. per person, although many hospitals allow only 80 sq. ft. Bedrooms are now usual instead of dormitories; some single rooms are desirable and the remainder should accommodate two or three beds. Cubicles are also used in some schemes.

Bathrooms—These should be grouped with lavatories and W.C.s in a central position in relation to the maids' bedrooms; one to every ten maids should be allowed.

Lavatory—One large lavatory is generally provided for the maids as the cost of providing basins in each bedroom is often too great. Lavatory basins should be provided at the rate of one to four persons exclusive of any that may be placed in the bathrooms. It is more satisfactory, and greater privacy is allowed, if the basins are placed in small cubicles with partitions of wood, metal or terrazzo, with a curtain to close the entrance to each compartment. Basins are better placed as separate units to allow plenty of elbow room rather than in a "range." If partitions are used they should be at least 3 ft apart and should extend from about

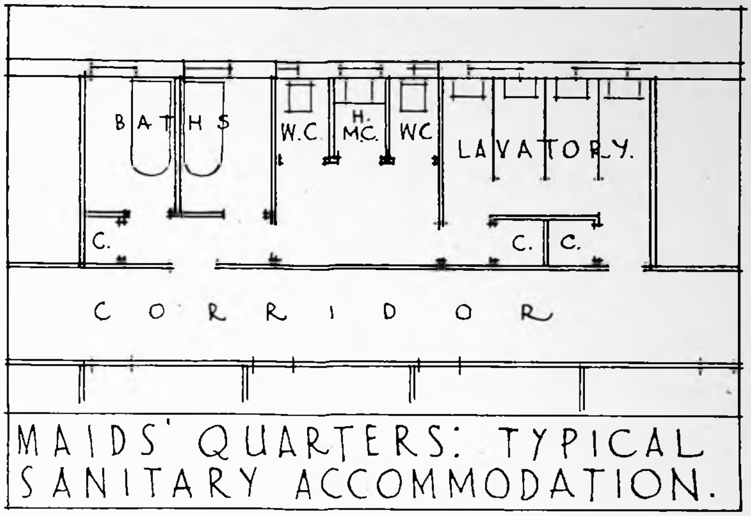


Figure 12

6 in above the floor level to a height of 6 ft 6 in.

W.C.s—W.C.s for the maids' bedrooms should be provided at the rate of one to ten persons. They should be grouped together with a housemaids' closet as shown in Figure 12, and placed as centrally as possible.

Boxes—A large box-room is a necessity and should be fitted with strong shelving at various heights to accommodate different sizes of trunks and suitcases. The room should be properly warmed and ventilated, although an outside wall and window is not an essential provision.

NURSES' HOME

General—This building is usually detached from the other buildings, and it should have a quiet garden with such recreational facilities as tennis courts laid out in it. A covered approach, although a great asset, is generally too costly. The floor area required by the bedrooms is generally approximately double that required for the common rooms.

Bedrooms—Some schemes do not differentiate between the requirements for sisters and nurses and for probationers, but others provide a larger room for sisters by using the normal spacing of three nurses' rooms to form two rooms for sisters. Each bedroom should have an area of 100 sq. ft., which would include the area occupied by the fitted wardrobe and lavatory basin. The rooms for night nurses should be either on the top floor or in a separate wing, and should be placed away from the sitting-rooms, which are apt to be noisy. A fault of many nurses' home plans, and one which must be avoided, is the provision of long, dull internal corridors with insufficient lighting and poor ventilation. Windows should be placed at each end of the corridor, and, if possible, other windows arranged at intervals along their lengths. The corridors themselves should be at least 5 ft wide and should be covered with suitable material such as cork, rubber, linoleum, or carpet, in order to reduce noise.

Staircases should be so arranged as to provide each room on the upper floors with alternative means of escape.

It is not necessary to provide fireplaces in the nurses' bedrooms, but a radiator is desirable and also an electric power plug point for emergency heating purposes. The bedroom floor may be finished with either wood or linoleum, as the carpeting of the whole area is too costly. The wardrobes required in the bedrooms should be at least 1 ft 9 in deep and should extend to the full height of the room. If these wardrobes are placed between the rooms they greatly assist in reducing the passage of sound from one room to another.

Lavatory basins should be grouped in pairs to facilitate the plumbing and water service. Figure 13 illustrates a typical unit lay-out of nurses' bedrooms.

Nurses' Sitting-room—The area of the sitting-room should be based on an allowance of about 20 sq. ft. per person for the maximum possible number of users at any one time, after deducting those on night duty, etc.

Sisters' Room—A similar allowance in area should be made for the sisters' room and a fireplace is generally provided, mainly for the sake of appearance and comfort.

Quiet Room—It is essential that the quiet room be placed so that it is not affected by noise from the general sitting-rooms and it should be equipped for reading and writing. An area of 200 sq. ft. is probably adequate.

Lecture Room—The lecture room should provide accommodation for about twenty persons, based on an allowance of 10 sq. ft. per person. The floor should not be raked, and movable desks should be used so that

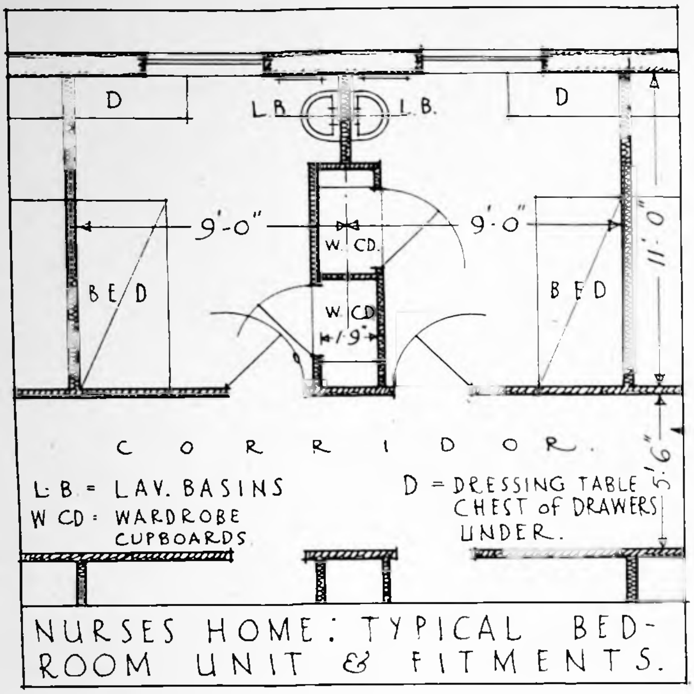


Figure 13

room may also be needed as the office for the home sister in larger schemes.

GENERAL SERVICES

Boiler House Block—The positions of the boiler house and other service departments (laundry, etc.) need very careful consideration, so that easy access from the road is obtained for deliveries in an inconspicuous position; at the same time, unnecessarily long steam or hot-water pipe runs must be avoided. The boiler house should be placed so that the prevailing wind, usually from the south-west, will carry smoke away from all other buildings on the site and should be at such a level that excavation is reduced to a minimum to obtain the necessary falls for service pipes. Figure 14 illustrates in diagrammatic form the main requirements and circulations of the boiler house block; the boiler room and destructor should both be close to the chimney shaft. Deliveries from outside, such as plant and fuel, should be on the side away from the hospital, to leave clear the other side for the destructor and pipe ducts to the hospital and to avoid dust and noise from deliveries. The main accommo-

the room may be used on occasion for other purposes. A blackboard and a cupboard for models are required. This room may be required for use as a teaching kitchen, when an apparatus store will also be needed.

Tea Kitchen—A tea kitchen should be placed near the sitting-rooms in an unimportant and cool position. Only a small larder within the kitchen is needed, as stores are provided from the main kitchen in the administrative block. A small room having an area of 70 to 80 sq. ft. inclusive of the larder is generally adequate. The equipment consists of a gas or electric cooker, sink, draining-boards and a china cupboard.

Hair Washing—The basins for this purpose are generally placed in one room having an area of about 100 sq. ft. Electric plugs for hair-dryers are generally provided and also a dressing-table and mirrors.

Bathrooms and W.C.s—Bathrooms and W.C.s should be grouped together on each floor as centrally as possible. The number should be based on the provision of at least one to every ten nurses. W.C.s are needed on bedroom floors with an allowance of at least one W.C. to ten persons and are better if each is not approached directly and separately from the main circulatory corridors, but from a secondary passage with only a single door from the main corridor.

H.M.C.— A housemaids' closet should be provided on each floor, and should be grouped with the W.C.s. The equipment consists of a draw-off tap and tray, a slop-sink and a cupboard for household utensils, dusters, etc.

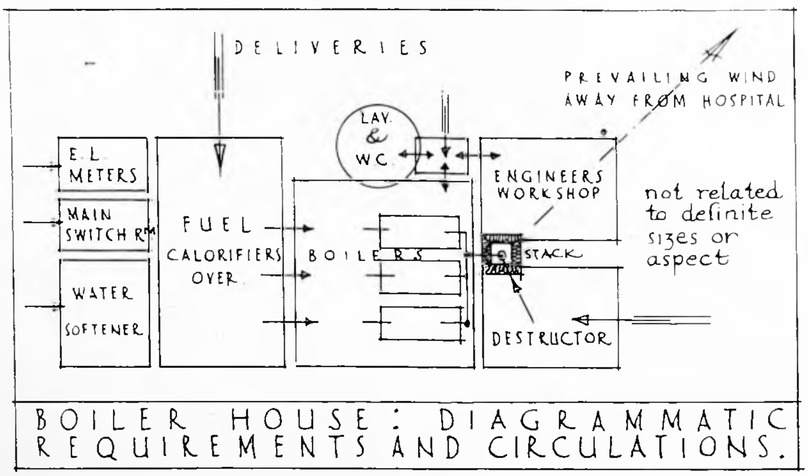


Figure 14

Lavatory and Cloakroom—Adequate lavatory and cloakroom accommodation should be provided near the entrance to the home and near the sitting-rooms. The cloakrooms are better if equipped with a locker for each nurse.

Drying Room—This room is used for wet clothing, and should therefore adjoin the entrance and cloakroom. Good ventilation and an adequate heating system either in the form of a coil or radiators is necessary.

Other Rooms—It is usual, in the most recent nurses' homes, to provide a small visitors' room and also a small hand-laundry where nurses may wash small articles which might be spoilt if washed in the general laundry.

A cloakroom and lavatory should be provided near the visitors' room. A

dation needed in addition to the boiler room consists of a fuel store, calorifier and pump room, small workshop, engineer's office and lavatory accommodation for the engineering staff, which should also be available for use by the gardening staff. The water-softening plant, electric meter and main switch room should also adjoin the boiler room to facilitate control by the engineers. The type of fuel to be used for the boilers naturally depends on comparative prices in the district, but sufficient storage area should be provided for either type and in all cases the bunker or tank levels should be carefully related to that of the delivery road to avoid excessive handling. Coal storage is required in addition to the boiler fuel storage. Plenty of enclosed yard space, properly screened from the hospital

buildings, is needed for general storage of such materials as ashes and boxes; the former are generally removed by way of the delivery road, but should be so planned as to avoid confusion and cross circulation. It is usual to provide either two boilers, each capable of carrying three-quarters of the total peak load, or three boilers, each capable of carrying half the load, so as to permit boiler cleaning or repairs to be executed without affecting the efficiency of the system. The floor and bunker areas provided should make allowance for future extensions to the hospital.

Boiler Room—The area required for this room is dependent on the type of boiler used and the sizes needed for each particular scheme. Good light, preferably from windows, is an advantage. The walls are satisfactory if executed in fair face brickwork. Granolithic paving is the most satisfactory floor covering, and doors should be large enough to permit the removal of a boiler or sections of a boiler according to the type used. An overhead track and hoist for the handling of ashes should be provided.

Fuel Store—The size of the fuel store is dependent on the most convenient quantities of fuel to be delivered at any one time. If solid fuel is used, the store should be arranged so that the fuel is tipped directly into it from lorries without hoisting; after which it should fall by gravity to the points from which it is shovelled into the furnaces or fed into automatic stokers; the latter may need high-level bunkers.

Workshop—This is used for minor repair work in connection with all engineering plant and equipment and also building and electrical repairs. The area should be at least 150 sq. ft. to accommodate proper benches, tool racks, spare parts, etc. Good light is essential.

Engineer's Office—A small room about 80 sq. ft. in area is needed as an office for the engineer in charge of the plant. It should be planned adjoining the boiler house.

Meter Rooms—A small room near the engineer's office is needed for the electric meters, and attached to it should be the main switch room. The gas and water meters are frequently placed in a small building near the entrance to the site. The meter rooms need no special fitting or equipments; the walls are usually fair-face brickwork and floors of granolithic. Ceilings are advisable for assisting the maintenance of an even temperature.

Laundry—Figure 15 illustrates in diagrammatic form the general lay-out and circulation required in a laundry building, an important point being the complete separation of dirty and clean linen. The dirty linen should be delivered from the hospital to either the staff or patients' receiving rooms, where it is sorted. The disinfector should adjoin the receiving rooms, as it may be required in connection with dirty linen subsequently to be washed, in addition to its use for bedding, etc. The linen is sorted in the receiving rooms and then passes through the washing section and drying chamber to the ironing section; after which it is again separated into the dispatch rooms. A soap and washing materials room should adjoin the washing section, while an office and general store are needed near the sorting rooms. A staff lavatory should also be provided.

Receiving Rooms—The two receiving rooms for patients' and staff linen should be separated. Open bins are placed round the room, into which the various articles are sorted from a central table.

Washing Section—The washing and ironing sections are parts of one large room which also contains the continuous drying chamber. One or two steeping tanks for foul linen should be placed in this room in addition to the ordinary wash-tubs, boiler, washing machines and hydro-extractors, together with minor mixing and boiling apparatus for soap, soda and starch. All doors must be sufficiently wide to take trolleys.

Drying Chamber—The drying chamber is a piece of apparatus mechanically heated and ventilated, which is fed from the washing side and discharges the clothes dried on the ironing side; the apparatus will probably occupy an area of about 120 sq. ft.

Ironing Section—After drying, the articles are passed into the ironing room. All flat articles such as sheets and towels are dealt with mechanically and also special apparatus may be used for shirts, collars, etc., but some provision must be made for hand ironing.

Dispatch Rooms—After ironing, the articles are again sorted into racks or shelves for each department or unit of the hospital or staff. These rooms should be about the same size as the receiving rooms. Some laundries make provision for airing the linen before it leaves the laundry unit, while others rely on the airing being done in the general linen rooms.

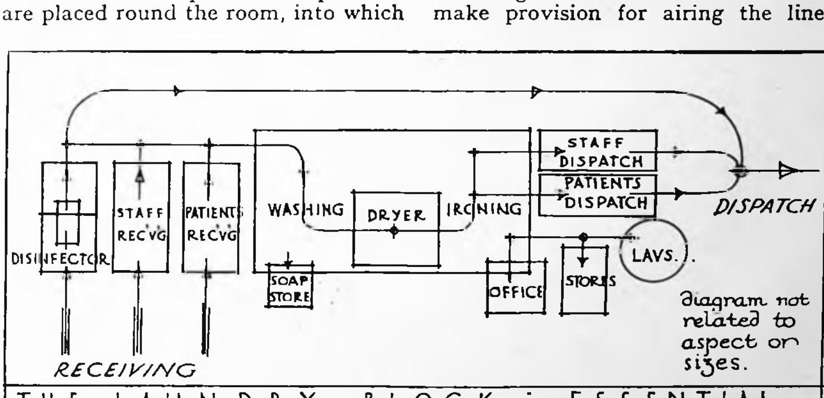


Figure 15

Disinfector—A full-size steam disinfector is usually provided, so that mattresses and similar large articles may be handled easily. The actual apparatus is a cylinder about 4 ft in diameter and 7 ft long, opening at each end into separate rooms, one for infected and the other for disinfected goods; these rooms must have no connection with each other except through the apparatus. Ample space must be allowed at each end for the removal of long articles. The two rooms should be at least 12 ft wide

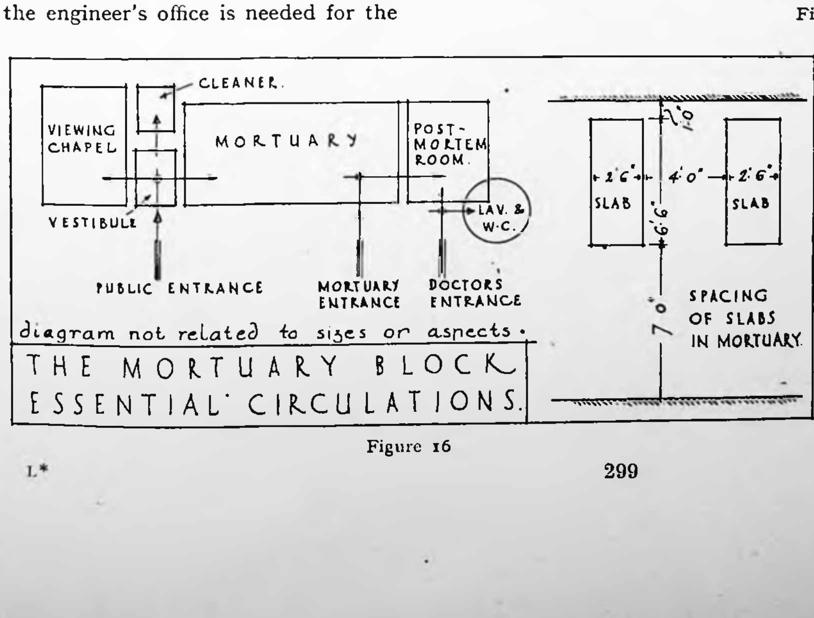


Figure 16

and have a total combined length of about 30 ft. A height of at least 9 ft is required.

Mortuary—This block should be placed in an inconspicuous position and should, if possible, have a separate entrance from the road for hearses. The building should contain three main rooms, of which the post-mortem room and mortuary itself should have northerly aspects, the viewing-chapel aspect being less important. In addition to the three main rooms a lavatory and W.C. for the medical staff and a cleaners' room are wanted. Figure 16 shows a diagrammatic lay-out for a mortuary block.

This room should be well ventilated. The bodies are placed on slabs of enamelled fireclay, terrazzo, or slate. The floors should be tiled or of terrazzo, with high dados of similar materials and should fall to one side, where a channel should be formed for sluicing purposes. A sink is also needed. Windows should be placed at a high level.

Post-mortem Room—This should be similar to the mortuary in regard to finishings. Good side light is important, with the addition, if possible, of top light. It is fitted with a central table, well drained and a hose connection attached. A large sink with a fireclay slab, lavatory basin, and slate or glass shelves are the remainder of the equipment. The room should have an area of about 200 sq. ft.

Viewing-chapel—This room is used for friends and occasionally for juries in connection with inquests. Separate outside access for visitors is desirable. An area of about 300 sq. ft. is generally adequate.

(See also sections: "Hospitals (Infectious Diseases)" and "Clinics")

18. *Hospitals (Infectious Diseases)*

Introduction—Hospitals for infectious diseases have many features similar to general hospitals for the treatment of sick persons, particularly in the design of the administration buildings, the nurses' home and the service buildings such as the kitchens, laundry, mortuary, etc. The special differences between the two types are in the design of the ward blocks, the addition of a discharge block, special facilities for disinfection of clothing and property and for the disinfection of ambulances. Some of the normal hospital services are much less used for infectious cases, as, for instance, the operating theatre.

Buildings for infectious diseases should be constructed so that alterations may easily be made to bring them into line with the latest medical opinions; many existing buildings are structurally perfect, but completely out of date and by reason of unduly heavy construction, unadaptable for modern needs except at very great expense. It should also be remembered that isolation hospitals are generally designed to meet the emergencies of epidemics and parts or sections of the hospitals are, consequently, not in continuous use. Every effort should be made in the design of the buildings to save unnecessary work for the staff, to obtain quietness for patients both from external noise—such as from railways or main roads carrying heavy traffic—and from internal noise due to bad placing of ward service rooms. It is also desirable that internal finish should be specially considered to aid staff work and to reduce risk of infection by designing for easy cleaning; but at the same time it must be remembered that the patients may have to spend long periods in the wards, so that the atmosphere of decorations and finishings should be as human and non-institutional as possible, though always kept within the requirements of medical efficiency.

Site—When the selection of a site for a hospital for infectious diseases is under consideration, there are several important factors which affect the final decision. The site should permit the buildings to have an aspect slightly east of south (see Figure 1), and should also, if possible, slope towards the south. The sub-soil should be dry. Protection from cold winds is desirable in the form of tree screens to the north and east, although these should not be close to buildings, to avoid stagnation of air and reduce risk of infection. Main services, such as a plentiful water supply, sewers and electricity, are important, but if not available it should be ascertained that water in sufficient quantity can be provided by well sinking, and that it is possible to dispose of sewage without difficulty; there appears to be no objection to turning sewage from isolation hospitals into public sewers without special treatment. Access from the homes of potential patients should be easy; distance, within reason, does not matter greatly as patients are generally transported by motor ambulance and visitors do not go to the hospital in large numbers. The site should permit of future extension without crowding the buildings together, in order that the buildings may meet the needs of a growing population, or if it should be decided to provide accommodation for additional diseases in the hospital at any future time.

General Planning — Ward blocks should be placed at least 40 ft from each other, or from other units such as the administration building, and also from the boundaries of the site, as shown in Figure 1, except in smallpox hospitals, where it is general to keep the buildings at least 150 ft from the boundaries of the site, although many authorities consider this distance to be totally inadequate and demand much greater isolation of smallpox hospitals; smallpox usually has an entire hospital devoted solely to this one disease, whereas ordinary hospitals for infectious diseases usually have blocks or ward units, each of which can be used for separate diseases, such as diphtheria, scarlet fever, enteric fever, measles or other infectious complaints. It seems customary to use certain blocks for specific diseases and then use an additional one as extra accommodation for epidemics of any of the complaints, as necessary. Efficient close fencing of the site is very essential, especially for smallpox hospitals, and all persons entering or leaving the building must be carefully scrutinised by passing either the administration building in small hospitals, or the porter's lodge in larger schemes: open fencing does not prevent contact or passing of goods between convalescent patients allowed to walk in the grounds and their friends.

A matter of importance in site selection, and more especially in the disposition of buildings, as regards general lay-out, is sewage disposal, as this is affected by the levels necessary to secure proper falls to drains between spread-out units and also the placing of the actual disposal area when public sewers are not available.

The important factors in the lay-out are the provision of good circulation to all units, easy food service from kitchens to ward blocks and the concentration of service buildings. Full advantage should be taken of falls of the site, and special care should be taken to place the power-house in such a position that excavation for pipe-runs to the units is reduced to the minimum. Power-houses having smoke stacks should be placed in due relation to the prevailing wind, so that smoke is blown away from the hospital buildings. Figure 2 illustrates diagrammatically the main

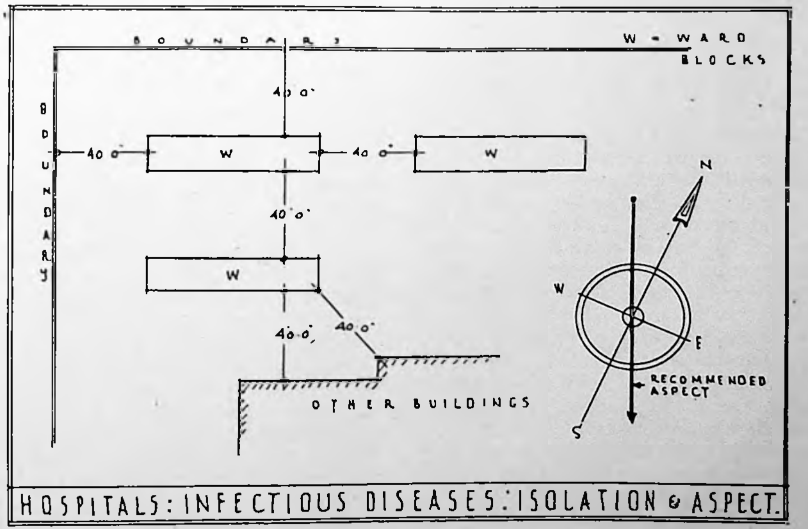


Figure 1

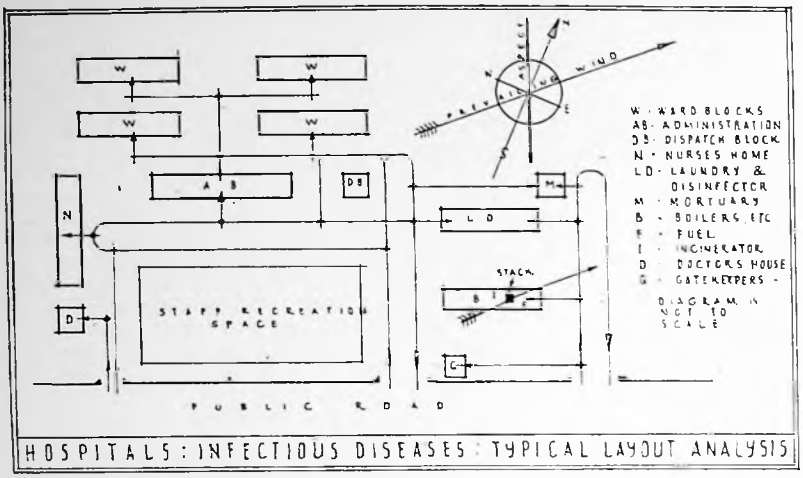


Figure 2

blocks, which are sometimes called isolation or observation units and, secondly, pavilion blocks. Cubicle blocks are a series of single or occasionally two-bed wards in which a number of patients having different diseases may be nursed when the number of patients of each type do not justify the operation of a number of pavilion blocks for a few patients; or, alternatively, they are used to house (a) patients having two separate diseases, (b) delirious, or (c) operation patients. The operating theatre unit is frequently attached to the cubicle block. Single wards are generally made 120 sq. ft. and about 10 ft clear in height; although greater areas and particularly heights have often been provided in the past, medical opinion, together with enforced economy, seem to have led to the smaller

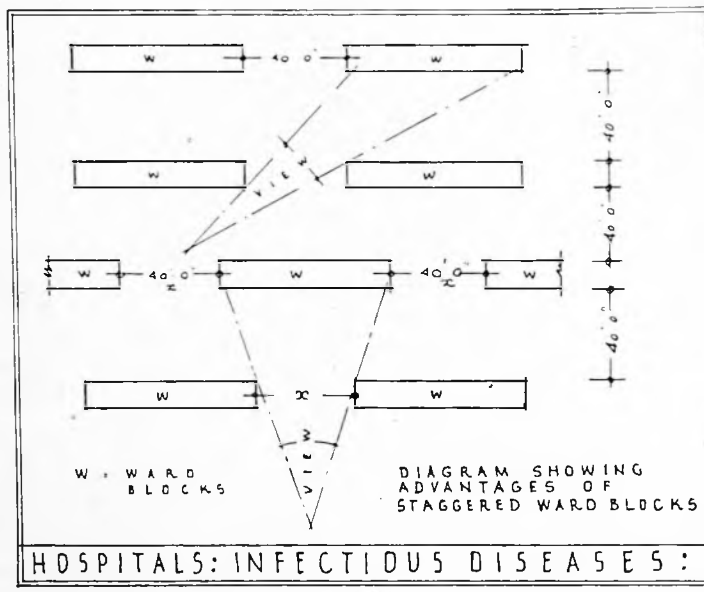


Figure 3

features of lay-out and circulation. The approach must pass the porter's lodge, if any, and go directly to the administration unit, or to service buildings; persons needing to go to ward blocks must pass the administration unit in order to ensure complete control. The administration unit should provide offices, matron's quarters, resident doctors' quarters unless a house is provided for the latter, as is necessary in larger hospitals, or where married doctors are likely to be resident; in small hospitals the nurses' home is often incorporated in the administration unit, but in all cases it is general for dining-rooms for domestic staff and nurses to be in the unit, as the kitchens are usually attached to it. The nurses home should be so placed that recreation facilities can be provided, preferably out of sight of the wards. Roadways suitable for ambulances must lead to all ward units. Covered-way connections between units and administration are not generally provided. Ward units should be placed so as to reduce distances, subject to the limits given above, between kitchens and wards as much as possible. The discharge unit should be situated between the ward units and the main exit roadway. The mortuary should be placed out of sight from the ward units and nurses' home and should also be in such a position that external access is easy and does not have to pass the hospitals buildings. The disinfector is usually attached to the laundry, but should have good road access, as this frequently has to serve as the district public disinfector for other goods in addition to those from the hospital itself.

Figure 3 illustrates two methods of disposition of ward units in relation to one another; if they are staggered, as in the lower half of the diagram, the view or outlook from the back row or rows of wards is greatly improved and therefore more pleasant for the occupants; whereas in the upper part of the diagram the view is very limited and the outlook is mainly confined to the back of another ward block. Any increase in the width between the units (marked x on Figure 3) in any one row increases greatly the advantages of the staggered planning.

Ward units are generally single-storey buildings, although occasionally two floors have been provided. Figure 4 illustrates the necessary spacing required between rows of ward units, whether single or double storied, in order to ensure sunshine penetrating to the wards in winter time, based on sun angles for London. The balconies usually provided in front of units cut off little sun in wintertime, but act as useful shade in summer when the sun is very hot.

Ward Units—In no circumstances should patients be accommodated in the administration block. Ward units are of two main types, both of which are desirable in all hospitals for infectious diseases; firstly, cubicle dimensions being generally adopted. Single wards usually have to be provided in a complete scheme at the rate of at least one single bed ward for every ten beds, but some of these may be attached to pavilion blocks and not all collected together in the cubicle units. Cubicle units are generally divided into two parts, for male and female patients, one group of rooms being placed on each side of a central group composed of the nurses' duty room, linen store and other communal stores. A greater number of rooms is sometimes placed on the female side to accommodate children, regardless of sex. Direct external access to each room is essential in a cubicle block, as the diseases may be different and therefore a covered verandah approach is needed the full width of the building. The sanitary annexes may either be placed near the duty room or at the extreme ends of the unit; they should have a sufficient cut-off from the wards and verandah, but the old system of

cross-ventilated cut-off lobbies seems unnecessary with modern plumbing and fittings. Cross-ventilation in the single wards themselves is essential, but the windows on the back wall should be considered from this point of view only and should not admit too much cold air from northerly aspects, nor much cross-light. The south wall, on the other hand, should be mainly window, to ensure ample air and also adequate light when the verandah roof is taken into account. The divisions between the wards are usually glazed from waist height upwards for the full width of the unit, to provide easy supervision by the nursing staff. Similarly, observation windows should be provided in the walls of the duty room, so that the staff may see all the wards while they are at work in the duty room: these observation windows in the duty room can be smaller in area and must be so placed that patients cannot see from one group of rooms through the duty room into the rooms of the other group, or, alternatively, the unit may have the two groups at an angle to each other, as shown on Figure 6, which is the system adopted at the recently completed hospital at Tolworth. If circumstances, usually due to the area of the site available, demand a two-story cubicle block, each floor must be exactly similar, having a duty room, store rooms and the full complement of sanitary rooms, etc., and in addition there must be adequate fire-escape staircases, while a bed-lift is almost a necessity. An internal staircase is not needed, as the circulation on each level must be in the open air, although covered by verandahs and the latter can be connected by an external staircase.

The sanitary annexes should be separate for each sex, and should comprise a bathroom, W.C. and sink room; one bathroom and one W.C. are sufficient for a group containing up to 15 or 16 beds. Many plans of these units show the sanitary annexe placed in the centre opposite the ward kitchen or duty room, on the south side of a circulation corridor; this system has certain advantages due to grouping of drainage and close proximity to the duty room, but has the very great fault of cutting off valuable light from the wards; it also prevents sunlight from reaching the duty room, which is very desirable and is achieved in both types shown in Figures 5 and 6. In addition to the patients' sanitary accommodation, a W.C. for nurses is needed in each block. Figure 5 shows the sanitary annexe cut off by a cross-ventilated corridor, but in many old types of ward blocks this corridor was not roofed over; but this system has now been dropped from general usage.

The verandah should be at least 7 ft wide and preferably rather more, in order to ensure dryness in wet weather. Some schemes continue the open verandah past the duty room by breaking forward as shown on the right-hand side of Figure 5, in order to prevent the duty room becoming a passage between the two wings. Lavatory basins must be provided either between each pair of rooms or in or immediately outside each room, for the use of the doctor and nurses. The details of the planning of the rooms forming the sanitary annexes and duty rooms are similar to that necessary for similar rooms in general hospitals. Doors to wards should be at least 3 ft 3 in wide, to allow stretchers and beds to be moved through them easily.

The scheme shown in Figure 5 is typical of the basic planning adopted for very many cubicle blocks; the chief variations are due to the placing of the sanitary annexe in the centre either in front of the verandah, carried past the duty room in the form of a corridor, or at the back of the central portion of the unit by forming corridors on each side of the duty rooms; the latter position can be planned satisfactorily, but the former is not good, as previously discussed.

The scheme shown in Figure 6 is a complete departure from the recognised planning of these units, but offers many advantages over the more usual types. The maximum of light and air is obtained by placing the access to the wards on the back or north side; the verandah on the south side is eliminated, and overshadowing of the wards. The sanitary annexes are grouped at the north side of the open corridor, and thus overcome many difficulties arising in other

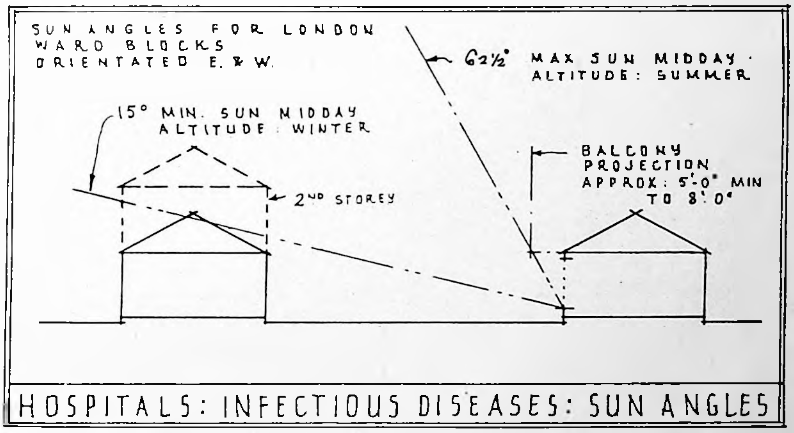


Figure 4

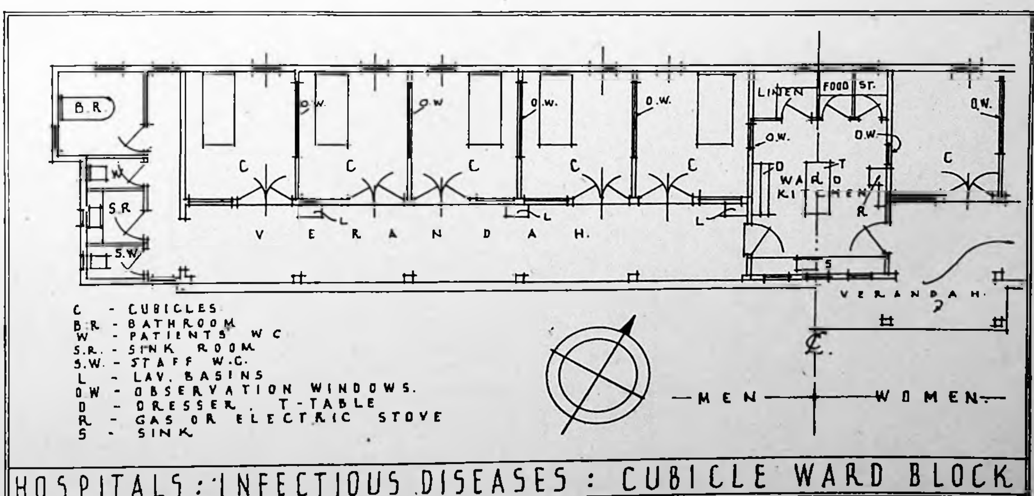


Figure 5

plans. The duty room is well placed for light and air and can supervise the wards properly. Cross ventilation for the wards in this type is available by placing windows over the covered access approach. The scheme as a whole allows every room to be thoroughly separated from all other rooms, external air cut-off being formed by the corridor between all sanitary apartments, wards, and duty room. Figure 6 shows a block designed for one sex only, but the bathroom and W.C. may easily be duplicated on each side of the entrance lobby in the rear block, as was the case at Tolworth. The corridor lavatory basins are conveniently screened in the recesses formed by the hexagonal setting out of the wards.

The foregoing paragraphs describe ward units for special and observation cases (cubicle blocks) ; the other usual type of ward block, pavilion blocks, is now to be discussed.

Each pavilion block is generally allocated to a separate disease or to a number of allied diseases. Wards in pavilion blocks are usually duplicated, one for female and one for male patients, on each side of a central service unit containing the ward kitchen, stores, and sister's room ; each ward has its separate suite of sanitary rooms. Wards should not have more than 20 beds, including any which may be included in single-bed private wards.

The minimum dimensions usually suggested for general wards are an allowance of 12 ft run of wall per bed and a total floor area of 144 sq. ft. per bed. The height of wards varies considerably ; some authorities desire 2,000 cu. ft. of air space per bed, which necessitates a height of nearly 14 ft unless the floor area is increased ; when the 2,000 cu. ft. basis is required, it is more usual to restrict the height to 13 ft and increase the floor area. There are, however, hospitals which have wards only 10 ft or 10 ft 6 in. in height and the standard floor area of 144 sq. ft., and this reduction in height is becoming more general. If this basis of 12 ft of wall space is used, the wards then have a width of 24 ft. If beds are placed with their long sides parallel to the outside walls, as in Figure 8, with dividing screens, a method which has been adopted in a number of recent hospitals, the bed spacing may still remain the same ; the screens, as discussed in the section on " Hospitals (General) " should have the upper part glazed for supervision of the ward by nurses from the duty room or ward kitchen and can have a projection from the outside walls of the ward of about 9 ft, leaving a clear gangway of 6 ft.

As an alternative (Figure 8), the span of the ward may be reduced to 21 ft, and the length devoted to each division is consequently increased to provide the 144 sq. ft. per bed. The width of the ward is based on an allowance of 3 ft between the outside wall and the bed, 3 ft for the bed itself, 1 ft 6 in for a bedside table and also to screen the bedhead from draughts, making a total length for the division screen of 7 ft 6 in with a gangway 6 ft wide. Beds are placed with the feet towards the ward kitchen to assist supervision. Beds should not be placed nearer than 12 ft centre to centre, as in closer spacing there is a risk of transference of infection by mucous expelled in coughing. It should be remembered that wards planned on the parallel bed lay-out should have the aspect adjusted from that used for the

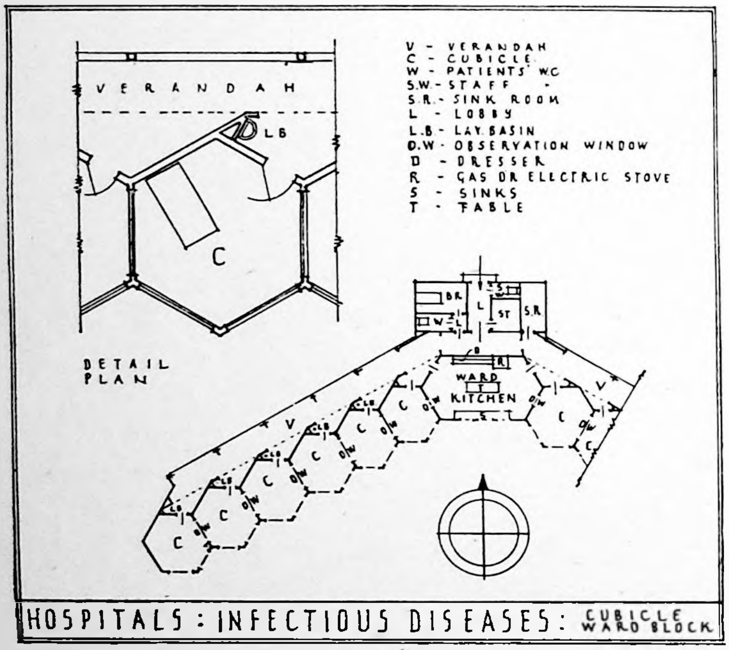


Figure 6

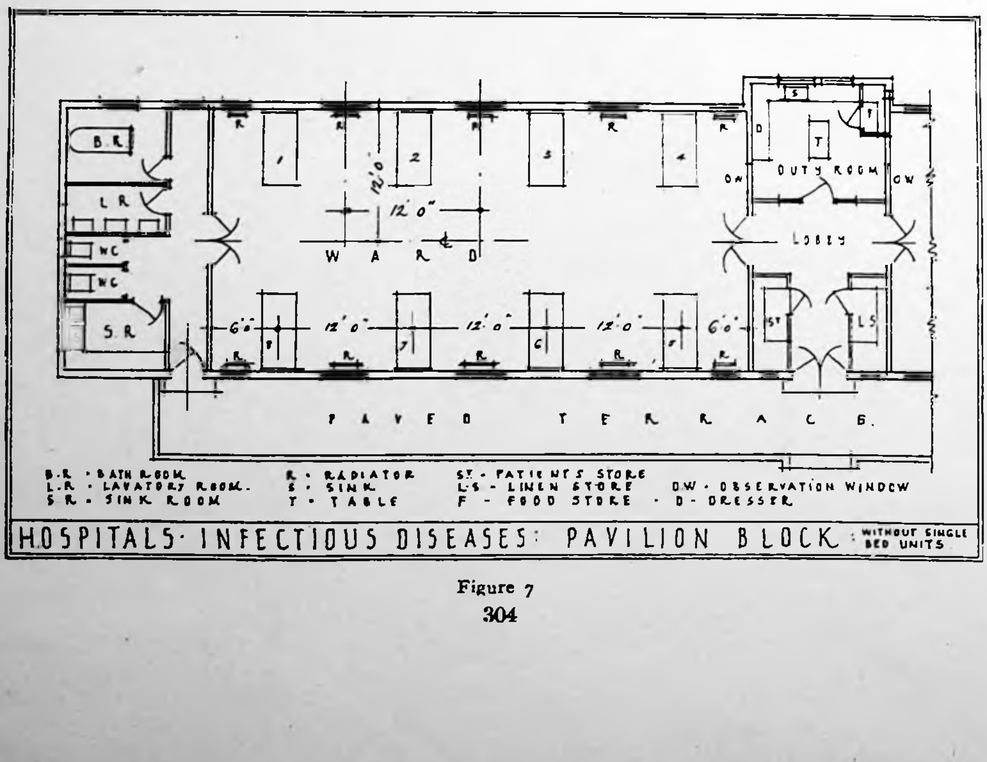


Figure 7

normal bed lay-out and, therefore, the main axis of the unit is north and south, in lieu of east and west.

The wards are constructed and finished as ordinary hospital wards, except that a lavatory basin is necessary in each ward for the use of the doctors and nursing staff.

Windows should provide an area of 1 ft for every 5 or 6 sq. ft. of floor area in the wards and, except when French windows are used for access to verandahs, sills should be about 3 ft 6 in above the floor, with heads as near the ceiling as is practicable. The normal hospital types of window are usual.

The sanitary annexe should contain a compartment with a bath and frequently a basin in addition, a W.C., or two W.C.s for large wards having more than 12 or 14 beds, a sink room with slop sink, steeping tank and bedpan airing chamber and in some hospitals a lavatory compartment is also provided. These rooms may either be placed at the ends of the wards, as shown on Figure 7, or at the other end of the ward adjoining the other ward service rooms: the former position

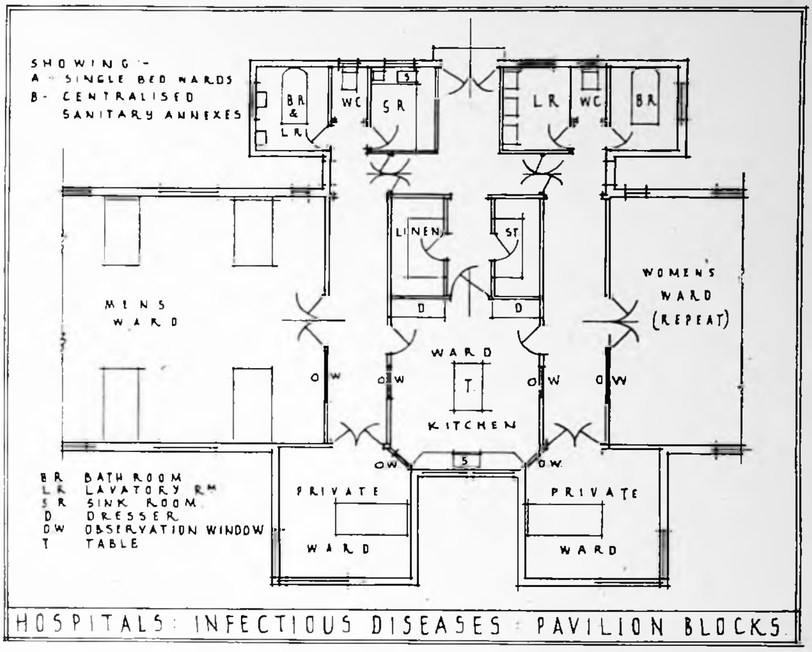


Figure 9

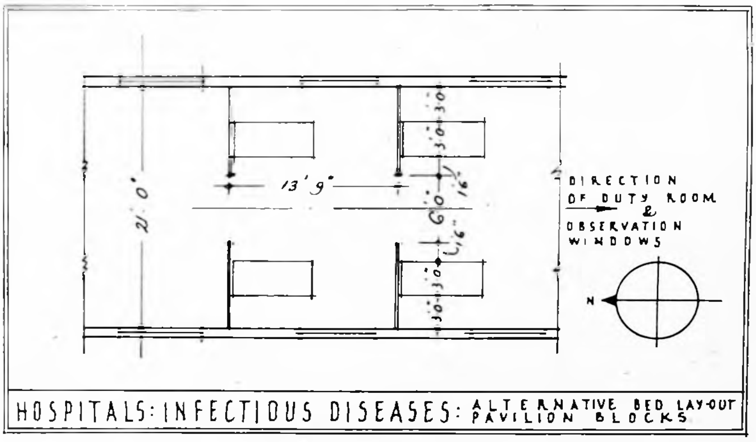


Figure 8

appears to be the most usual, although the latter position has been adopted in several recent isolation hospital plans on the ground that the nurses do not have to walk so much, as the sanitary annexe is nearer the ward kitchen or duty room; also by this arrangement the outside ends of the wards are left free for covered verandahs in a position that does not interrupt the light to the ward windows, as is the case when the verandah is on the south front of the ward block. The position of sanitary annexes near the entrance to the ward has additional advantages if single wards are also incorporated in the pavilion unit, as these are generally placed near the main entrance to the block; also many authorities do not consider the ventilated cut-off passage, as shown in Figure 7, a necessity with modern sanitary fittings, and will admit of sanitary rooms being approached directly from the ward; but such placing should not necessitate the nurse or patient entering the main corridor to obtain access to the sanitary annexe from the large ward.

Verandahs—Opinions vary as to the necessity of providing covered verandahs to normal pavilion blocks, and in many hospitals they are omitted and only a paved terrace is provided on which beds may be placed if desired, but in many hospitals the means of access from the wards does not permit of beds being moved into the open air. Patients in some hospitals are moved into special convalescent blocks when well enough and special facilities for open-air treatment is therefore provided in connection with these blocks as is discussed later in this section. It is an advantage to have some part of windows or separate windows to ventilate the wards above the roof of the verandahs when provided, which is easily achieved if high wards are used, as verandah roofs need not be more than 8 or 9 ft above the ward floor level.

Service Rooms—The main rooms to be provided are the nurses' duty room or kitchen (occasionally separate rooms), nurses' lavatory and W.C., linen store, room for patients' clothes and boxroom. The ward kitchen requires an area of about 250 sq. ft., but very varied sized rooms have been used from 120 sq. ft. to 350 sq. ft.; the equipment should comprise a small range, usually gas or electrically operated, a sink, draining boards, dresser and a small larder mainly for storage of milk, although a refrigerator may be more satisfactory now that this is a common article of equipment. Space for table and chairs is needed for working, especially if no duty room is provided. The duty room or sister's room, if separate, should have an area of not less than 80 sq. ft. Aspect has some bearing on the placing of these rooms, as a northerly aspect is unpleasant for the occupants of the rooms; but if a larder has to be incorporated, as shown in Figure 7, a southerly aspect then becomes undesirable.

Single-bed Wards—Many hospitals have some single-bed wards attached to the pavilion blocks; these wards may be provided in two ways: first, by separate wards as attachments to the block in some way, such as shown in Figure 9, or, secondly, by cutting off by means of screens one or more beds of the general wards. If the latter procedure is adopted, glazed screens are usually used above a height of 3 ft or 3 ft 6 in, with an approach door out of the corridor leading to the main ward and not out of the ward itself. Sometimes separate sanitary accommodation is provided for each single ward, although this is not general. Single wards may be reduced in floor area to 12 ft by 10 ft, with a height of 10 ft, but some authorities

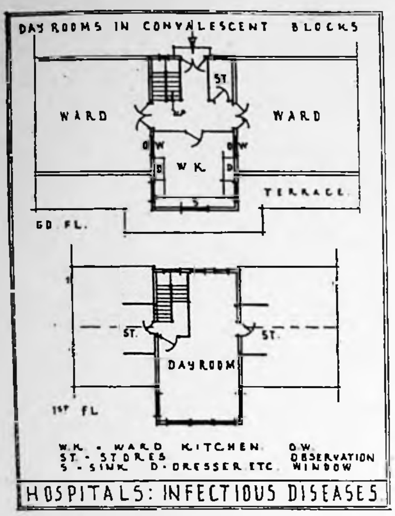


Figure 10

still prefer to use wards having a cubic content of 1,440 cu. ft. Figure 9 shows an arrangement of single wards together with centrally placed sanitary annexes. The difficulty in the planning of the single wards is to avoid, as much as possible, obscuring the light to the main wards.

Rooms for Convalescent Patients—Provision for convalescent patients is made in many hospitals in the form of day-rooms ; some hospitals have entire ward blocks devoted to convalescent patients, but this does not seem a general rule ; but when these are provided they are similar to the normal pavilion blocks, with the addition of covered verandahs and a day-room, the latter very frequently placed in an upper floor over the central portion of the ward unit occupied on the ground floor by the ward kitchen and similar rooms. Other hospital schemes do not have separate convalescent blocks, but have a day-room in a similar position in each normal ward unit. These day-rooms do not need to be very large in area and a floor space of about 500 sq. ft. is adequate for a ward unit containing up to a total of 24 beds, as only a small proportion of the patients are well enough to leave the wards. Male and female patients share day-rooms. Day-rooms should have a clear height of 10 ft or 10 ft 6 in from floor to ceiling. Figure 10 illustrates a typical plan of a convalescent ward unit with the day-room placed on an upper floor, approached by a staircase from the hall of the unit. The day-room should have ample window area in the south wall, with some windows on the other walls to provide cross-ventilation. The area of the ground floor covered by the day-room is usually limited to the width and length of that part of the ground floor occupied by service rooms (less the area of staircase), as the latter do not need to be so high as the wards themselves ; the floor level of the day-room is therefore at a lower level than would be necessary if the wards were partially built over. Many plans show the staircase placed near the south wall of the day-room, which is usually necessary if the ward kitchen is placed on the north of the block ; but this position reduces the floor area available in the day-room near the main south windows, and should consequently be avoided, as sunshine is of great importance in all rooms in which patients spend any considerable part of the day.

Heating of Ward Units—The heating of ward units presents a rather greater problem in hospitals for infectious diseases than in ordinary general hospitals, owing to the units being spread out over a greater area and being separated from each other. It is usual in large schemes to have a central boiler plant supplying steam or hot water for all units, and to install calorifiers in each separate unit. In some smaller schemes separate plants are installed in each unit, as these may be shut and out of use except during epidemics and such a system has proved in some instances to be more economical. It is of great importance that everything should be done to ensure cleanliness and to eliminate places in which disease and infection may be harboured ; in consequence consideration should be given to the type of radiator to be used and also the positions of all piping. Panel heating in walls or ceilings is specially worthy of consideration and when radiators are used they should preferably be of a type which will swing away from walls for periodical cleaning, which is difficult with some other types. Continuous pipe-ducts or crawling ways under floors and roads are desirable for all piping, both for hot and cold water supplies and central heating ; in order to avoid excessive digging for such ducts and also to lift the separate buildings well above the surrounding ground, the ground-floor level of ward blocks is often raised several feet above ground level. The sizes necessary for the calorifier chamber and ducts vary too much, according to the sizes of the units and the lay-out of fittings, to give any definite sizes.

Telephones, etc—It is most important that all wards are connected to the administration building by telephone and a fire alarm system is often incorporated. Provision should be made for local fire extinguishers, etc., and in large schemes hydrants are desirable near each unit, with water at an adequate pressure for fire hoses.

Discharge Unit—All larger hospitals provide a special discharge unit, which is usually placed near the main

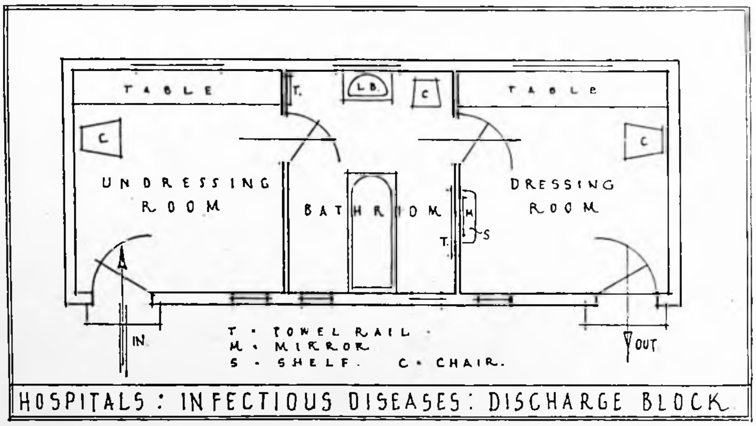


Figure 11

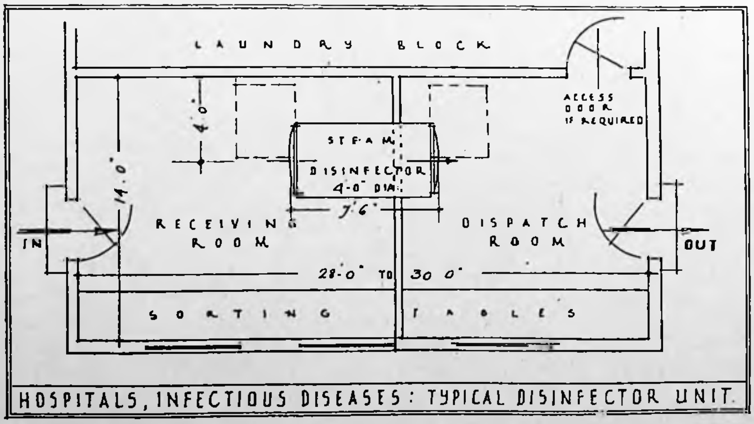


Figure 12

roadway and apart from all other buildings, although sometimes placed near the laundry and disinfector group. The accommodation is very simple and consists of three rooms. In the first room the patient takes off all clothes worn in the hospital and leaves them for disinfection, and passes to the second room, in which he bathes and then dresses in clean clothes in the third room. The areas required for these rooms are about 100 sq. ft. for the two dressing-rooms and for the bathroom about 65 sq. ft.; slightly greater areas are an advantage. The height should be at least 9 ft in the clear. Figure 11 illustrates a typical discharge unit plan and the planning of windows should be noted, in order to provide cross ventilation. The figure also shows that direct access is needed from the open air into both dressing-rooms, while equipment and furnishing are reduced to absolute necessities, such as a table, chair and mirror in dressing-rooms and the bath, a lavatory basin and a chair in the third room.

Disinfection — Great importance has to be paid to the provision of adequate facilities for disinfection in this type of hospital. Attached to the laundry should be steeping tanks for the preliminary disinfection and rinsing of infected and soiled linen, and also a disinfecting chamber to contain an apparatus for steam treatment of blankets, bedding and other articles which cannot be washed. This disinfector apparatus for larger schemes generally requires an overall length of about 18 to 21 ft, with circulation space in addition and consequently necessitates two rooms having a combined length of about 30 ft. The apparatus consists of a large drum about 4 ft in diameter, through which passes a trolly which is loaded in one room and unloaded after disinfection in the adjoining room. Ample space is needed adjoining the apparatus, as many articles to be handled are large. The disinfector is generally planned in conjunction with the laundry and often has direct access from the disinfected side into the main wash-house. For smaller schemes, and where steam is not available for the disinfector, a smaller apparatus of varying other types is installed. Sometimes a formalin spraying chamber is provided, but this does not appear to be general equipment. Figure 12 illustrates a typical disinfector installation for a moderately large hospital scheme, which may also be called upon to deal with outside disinfection from houses, etc., in the vicinity.

The garages for ambulances should be separated for each vehicle, as it is necessary to disinfect them after use, which is done by shutting up each vehicle in its own garage.

(*See also section*: "*Hospitals (General)*")

19. *Clinics*

Introduction—Clinics are maintained mainly by public authorities, but are also administered by private and semi-public organisations and are sometimes attached to hospitals, as a means of providing varying groups of persons with medical advice and attention. One of the more important types of clinic is that devoted entirely to maternity and infant welfare and where ante-natal patients are received, together with infants from the time of birth to at least school age. This type of clinic is sometimes attached to maternity hospitals, to training centres for child nurses and even to day nurseries or crêches where children are left during the hours in which their mothers are at work. Attached to many of the general type of clinic are facilities for remedial orthopædic treatment and most clinics make provision for dental treatment. Sometimes provision is made for semi-social activities, such as clubs where mothers and children meet for lectures and demonstrations and may have light refreshments such as afternoon tea.

Clinics may be devoted entirely to one branch of medical treatment, such as those concerned with tuberculosis, rheumatism, dental treatment, etc. Such clinics are often organised as units apart from normal general clinics established by local authorities, and are frequently attached, as far as organisation is concerned, to public or private bodies whose work concerns the particular branch of medicine to be treated at the special clinic.

Some of the larger towns provide buildings in which many varied activities are carried on under one roof and involve separate departments as, for instance, orthopædic, general medicine, dentistry, tuberculosis, maternity, child welfare, electric therapy, ray treatments and medical baths thus involving a very large building which must also provide for a considerable staff, both medical and administrative.

Sites—The choice of sites for clinics is often somewhat difficult, and usually depends on the size of the town, its population and the area over which the population is distributed.

Large towns may have the central administration of the clinics either at the municipal offices, where the medical officer of health for the district is likely to have his offices, or it may be attached to a large central clinic. The larger towns often need smaller branch clinics dealing with maternity and child welfare organised, for example, in detached housing schemes and similar concentrations of population and have more specialised central clinics, to which patients are sent with particular diseases or for special treatment, of which one only of each type is probably necessary; these special clinics may either be separate buildings, or may be grouped together in some position to which access from all parts of the town is more or less equally easy. Generally it is desirable to choose a site to which access may readily be obtained by the public transport services, such as buses or trams and generally near the main concentrations of the population, although these two points may be found almost impossible to satisfy, as the general lines of transport lead to the centre of towns and the population is often spread more or less evenly round the outskirts.

Those clinics whose work is mainly among children, and especially those to which there are attached nurseries and crêches, should have ample space around them for gardens and open-air playgrounds. All clinics should be placed on sites which permit of good light, ample ventilation and, if possible, quietude. Sites on main traffic thoroughfares and similar high-value positions are unnecessary, and back land without extensive frontages can often be utilised to advantage for buildings of this nature.

The buildings need to have at least certain departments on the ground floor, and, except on confined sites in congested areas, a large site area is helpful in order that the rooms dealing with patients to whom stairs present a difficulty may be placed on ground floor levels. Upper floors for many departments necessitate the provision of bed lifts for patients in invalid chairs of various types, some of which are nearly 7 ft long and for the occasional stretcher case.

When multi-storied buildings are involved, maternity and child welfare should be on the ground floor and, if possible, the tuberculosis department should be similarly placed.

Village Clinics—In villages, where the population is small, clinics are often held in the village hall, as is described in the section on "Community Centres". Clinics in buildings of this nature are usually confined to one or two afternoons each week and the rooms, excepting perhaps one room, are normally used for other purposes, and not specially designed as part of a clinic; such clinics are generally devoted to maternity and child welfare, dentistry and possibly for eye-testing, so that patients who need assistance of a more specialised treatment are sent on, after preliminary examination, to other clinics or hospitals.

General Lay-out—Figure 1 shows a general analysis of the larger type of clinic building, but the chief principles remain the same for all types, even when there is little more than one department.

One main entrance is usual, which serves all departments, although secondary or individual entrances are often provided to certain special departments, such as child welfare, tuberculosis and an entrance by which invalid chairs and perambulators may

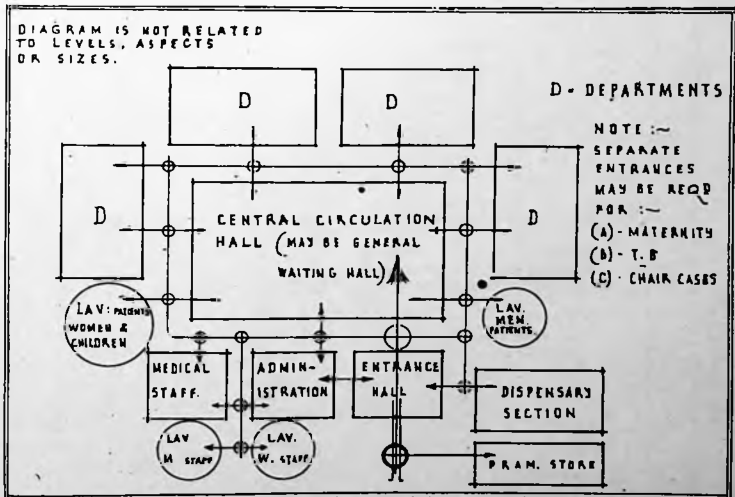


Figure 1

enter by a ramp and go straight to the lifts if the building has upper floors.

Adjoining the entrance should be placed covered and preferably enclosed facilities for the temporary storage of perambulators. Near the entrance, in larger schemes, certain rooms are generally needed for the main administration. Rooms for the medical and nursing staff, together with cloakrooms and lavatories, should be approached from a circulation apart from that of the patients ; some general rooms are needed other than the actual consulting rooms and may, in very large schemes, involve a small laboratory, library, dining-rooms, in addition to rest rooms, offices and record rooms.

The patients usually go from the entrance hall into a central main hall which may serve as general waiting room for all departments, or only as waiting room for those who do not know to which department they go, or are waiting to see those connected with general administration. In large schemes each department is likely to have its own waiting hall. Refreshments are often available in the main waiting hall. Lavatory accommodation for each sex must be attached to the waiting halls.

The dispensary, which may serve both medical requirements and also sell special foods, such as baby and invalid diets to patients of clinics, should be adjoining the waiting hall, except perhaps in large establishments, where it may be placed in the central or entrance hall, or even attached to individual departments.

In multi-storied buildings staircases and lifts should lead from the central hall and should be placed in such a position that they are quickly seen on entering the hall. A direct external entrance for invalid chairs into this central hall should be provided, as previously suggested. The departments should all be approached from this hall and should be considered as quite separate units.

If the central hall serves also as waiting room for the departments, a secondary circulation is desirable, so that patients after examination or treatment do not necessarily re-enter the hall ; a circulation of this type should not pass through other departments, nor if possible should there be any chance of patients of various departments intermingling.

Waiting Hall—The waiting hall is a centre about which the whole of the work of the clinic revolves, and in consequence many doors and corridors have to be planned leading off it to rooms and even whole departments. In the small clinics one room serves as waiting space for all departments and all purposes, but in larger schemes some, if not all, the main clinical departments are likely to need their own waiting rooms, thus leaving the main waiting hall as a circulation space and for persons waiting for attention from certain general departments or services such as administration, first attendances, dispensary and possibly food service.

The waiting hall in all schemes needs to be a large room in relation to the size of the whole building, and a satisfactory floor area to allow is 8 to 10 sq. ft. of space per head of the estimated number of persons likely to be waiting at any time. The most satisfactory shape of the room is rectangular, as it usually allows better arrangement of seating and better planning of the surrounding rooms. Although a large number of doors leading from the room are almost essential, these should be reduced to a minimum, particularly by the introduction of surrounding circulation corridors from which the individual consulting rooms or departments may open. The hall should be well proportioned, both in plan and section, so that the general effect of the room is pleasant and spacious. Many schemes rely entirely on top-lighting for the waiting hall, with ancillary rooms on all sides, but there is no doubt that a large room of this character is much more pleasant if some normal side-lighting from windows can be arranged, especially if the outlook is over gardens or well laid-out courtyards. On the other hand, lighting into small areas is undesirable. When side light is provided top-lighting may also be needed if the rooms are very large, in order to avoid darkness in those parts of the waiting hall away from the windows.

Waiting Hall Seating—The furnishing of waiting halls generally consists of long benches, which are arranged in rows. Benches should not be spaced too close together, nor should they be very long, as they become too heavy to move easily for cleaning purposes. A good spacing for benches from back to back is 3 ft, and a length of 1 ft 9 in per person is adequate, with a maximum length of 10 ft 6 in long (six persons), though it is better to reduce the seats to about 7 ft in length for ease of handling. Benches usually have backs and are without arms, but arms at the ends seem desirable, at least for reasons of strength. The seats are sometimes of wood, although upholstery is often provided to make the benches rather more comfortable for invalids. Chairs are sometimes used, and give a more pleasant and less formal appearance. The main objection to chairs appears to be from the point of view of noise. If the room is to be used for refreshments and particularly if it is likely to be used for such purposes as a " mothers' club " in conjunction with a maternity and child welfare clinic, tables and chairs seem to be the more suitable type of furnishing.

Figure 2 illustrates the spacing needed for benches in waiting halls. A space of 6 ft wide should be left for circulation round the room between seats and the walls, except, perhaps, near walls without openings. Four feet widths should be provided between ends of seats. This figure shows two methods of arranging seats : firstly, in Diagram A, seats all facing in one direction ; secondly, in Diagram B, seats placed back to back. The latter arrangement is more pleasant, as groups of patients may talk together more easily. Type A may be better if the entrances to the consulting rooms are placed towards one end of the room, but this consideration does not arise if the doors are on opposite walls, or in the walls towards the ends of the benches, when arrangement B is quite satisfactory.

Patients' Lavatories — Lavatories are needed for both sexes in conjunction with the waiting hall, but it seems desirable that these should not open directly off the waiting hall, especially those to be used by male patients. The lavatory entrances, in any case, should not be placed too near one another.

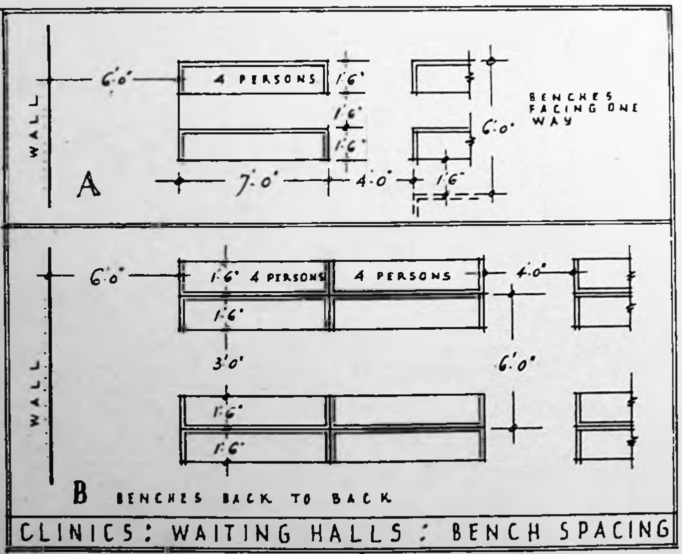


Figure 2

Waiting Hall Refreshments—When refreshments are to be served in the waiting hall a small counter should divide the kitchen or servery from the hall and the opening should be capable of closure when not in use.

Waiting Hall Type Plans—Figure 3 shows in diagram form the general arrangement of a typical waiting hall. The lavatories for male patients lead from the entrance vestibule at the approach to the main room. In order to reduce the number of openings, surrounding corridors are used as approaches to the various departments and consulting rooms, so that the doors for these purposes are reduced to two, while the remainder of the openings are those to the buffet and to the women patients' lavatories. Top-light is indicated, but in addition side windows are also suggested unless

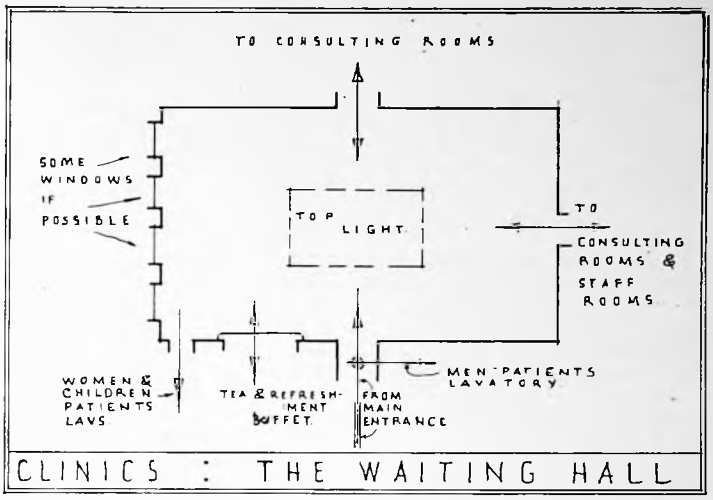


Figure 3

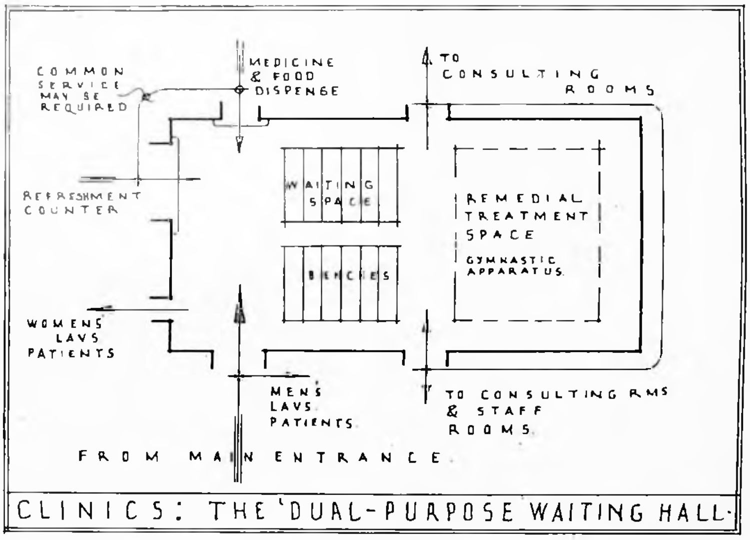


Figure 4

further rooms have to be planned on the fourth side of the main room.

Some waiting halls have special features incorporated in their planning and decoration as diversions or interests for the patients, especially children. Such features include an aviary, a fish pond, or a fountain. When features of this nature are to be introduced, care must be taken that they do not obstruct circulation, and that they are designed as a definite part of the decoration scheme.

Figure 4 shows a further type of waiting hall sometimes used in smaller schemes when the cost of providing remedial treatment rooms or gymnasia cannot be undertaken. Part of the waiting hall is used at some periods as a gymnasium and may, if desired, be divided from the waiting hall by a folding screen or partition. This figure also shows the refreshment service counter and the medicine and invalid food dispense placed close together, as the same staff may have to control both these services, and in fact on occasions they are contained in one servery. The ample space near all circulations other than those to the consulting rooms should be noted. In this example all the staff and consulting rooms are kept together on one side of the waiting hall to assist control, supervision and administration. Certain of the staff rooms for administrative purposes may need to be near the entrance, but at the same time connected with the remainder of the staff rooms.

The waiting rooms for separate departments are similar in most respects to the main hall so far discussed, except that they are smaller, do not need rooms adjoining for such services as food and have less rooms opening from them. Again side-light is desirable and in small rooms is to be preferred to top-light.

Departmental Accommodation—An individual department may consist of one room only, or may require a large number of rooms; the numbers and sizes are largely dependent on the extent to which persons may be likely to require the services of the department, the number of sessions per week that the department is available and the branch of medicine for which the department is required; for example, an ophthalmic department may need one main room only in which consultations, eye-tests and treatment take place, although in a large establishment this main room may be repeated several times, but without many additional rooms; as an alternative example where several rooms are almost always necessary, a dental department where, in addition to the room used jointly for consultations and treatments, a recovery room and workshop are usually needed. As already stated, each department may have its own waiting room, and in some schemes the department may be of such a size that it even necessitates a separate building or wing.

Consulting Room—The consulting room is the central working unit of most departments and around this room (or rooms in larger schemes) may be grouped all other departmental rooms. The sizes of consulting rooms depend largely on whether treatment is likely to be given in addition to examination of patients and the type of equipment needed for such treatment. The same consulting rooms are sometimes used for different purposes during various parts of the day or on different days of the week; for example, an ophthalmic consultation room may be used for ear, nose and throat work. Occasionally in small clinics one room serves for all consulting and treatment purposes, and for ante-natal, general medical and child welfare examinations, eye-testing and dentistry, but this should be avoided whenever the clinic is sufficiently large, especially by the separation of dentistry, which needs special equipment and services not usually necessary for normal medical consultative or treatment purposes.

Consultation Rooms: General—All consultation rooms need lavatory basins and, in some departments, sinks in addition. Consultation rooms

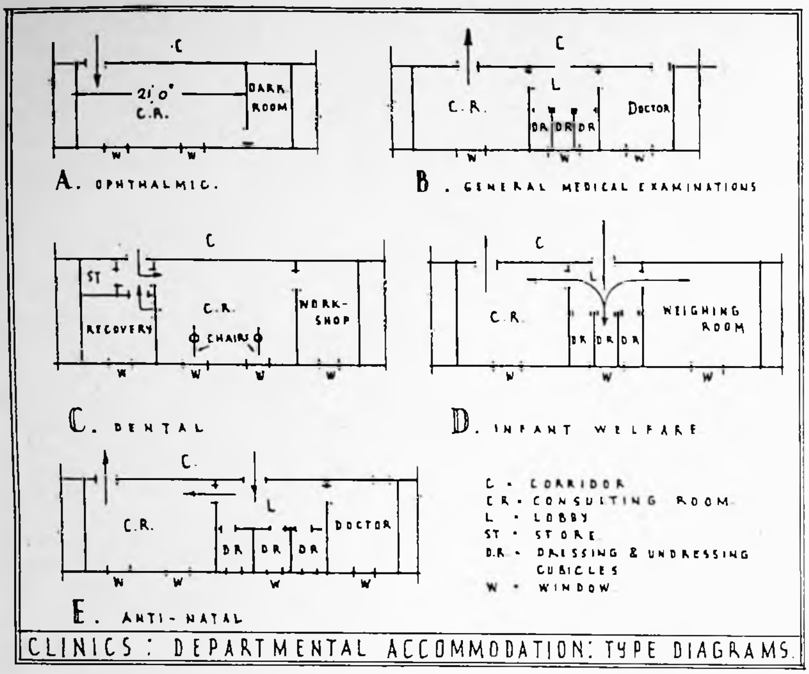


Figure 5

should not be less than 9 ft high, and this figure should be increased for rooms having more than a minimum depth of, say, 12 ft, as good lighting is so very essential for all types of examination and consultation. For general purposes where examination of patients and discussions with doctors and nurses only take place, without actual treatment, the rooms should have a floor area of at least 150 sq. ft., and preferably about 200 sq. ft., to allow ample space for the examination couch to be accessible on all sides and for the doctor's desk and several chairs. Rooms to be used for purely administrative work by visiting doctors may be smaller, say 120 sq. ft., but it is general to consider these as normal private offices which have to accommodate the usual office furniture without basins, sinks or examination couches.

Departmental Lay-out—Figure 5 shows in diagram form the general arrangement of various types of accommodation for certain departments. Type A is the simplest, being used for those departments in which the patients do not normally need to undress. The actual example is based on an ophthalmic department, which needs a clear length of 21 ft for eye-testing, and generally needs a dark room attached to it ; the 21 ft length may be given diagonally to reduce slightly the longest dimension of the room. The width of rooms is dependent to some extent on the planning of other parts of the departments and the building generally, but 12 ft should be considered as a minimum ; also the window wall should be the longest dimension of the room to avoid deep and narrow rooms in all plans.

Type B is a general medical consultation department where, in addition to the consulting room itself, dressing room accommodation is often necessary and also another room for use as doctor's office, nurses' room, or sometimes as a general dressing room for children. The access from dressing rooms to consulting rooms should be planned in such a manner that patients do not enter any general circulations. The amount of dressing accommodation varies considerably, in some large schemes many cubicles or dressing boxes are attached to each consulting room.

Type C shows diagrammatically a dental department. Through a small ante-room or lobby the surgery or treatment room is approached ; in this example the treatment room shows two chairs. Any number of chairs may be required in this room, and their placing is dependent only on sufficient space being allowed for each chair and the dentist to work with such necessary services as are required ; artificial light is used for all chairs which are planned away from the direct light of windows. When only one or two chairs are required these should be planned opposite and near to windows. Immediately adjoining and leading from the treatment or consulting room should be a recovery room, in which a number of chairs and couches may be placed, as well as certain special equipment ; the recovery room must also have access to the general circulation without re-entering the treatment room, and in many examples this access delivers as quickly as possible to the main way out of the building, so that patients after treatment do not circulate amongst those awaiting treatment. Adjoining the treatment room in all larger dental departments there must be a workshop and a small store room ; the latter may open out of the workshop in preference to the position given on the diagram.

Dental Departments—Figure 6 illustrates in greater detail a typical dental department for an average-sized clinic. The dental surgery itself acts as both consulting and treatment room and has an area of about 500 sq. ft. ; the area is amply sufficient for the three dental chairs shown. If one chair only is required the area of the room may be reduced to about 150 sq. ft., preferably allowing a minimum width of 12 ft. A lavatory basin is needed, and a sink is frequently provided in addition. The chairs should be spaced not closer than 8 ft apart centre to centre, while it should be borne in mind that most of the work is carried out by the operator standing on the right-hand side of the chair, so that the right-hand chair should not be placed too close to the wall on that side. The chairs each have a window directly in front of them. Each chair requires a number of services, namely, water supply and drainage to the mouth-wash basin attached to or adjoining the chair, electricity for artificial light, power for drilling and other purposes and a connection for low-voltage lamps.

The normal recovery room has a number of lavatory basins fixed at a low level in order that patients may use them when seated on chairs. A room having an area of 150 sq. ft. is sufficient for small surgeries with one chair, but this needs considerable space or, better, two rooms, as shown in Figure 6, for use in conjunction with larger surgeries having several chairs. The figure shows a separate gas recovery room, into which patients may be carried from the dental chair either on stretchers or movable couches through double doors provided for the purpose ; this room is also equipped with lavatory basins placed at a low level adjoining the couches.

Welfare Departments—Type D on Figure 5 is an infant welfare department ; this needs direct access to dressing rooms, from which the children may pass directly to the weighing rooms and thence, at the request of the doctor, to the consultation room. The weighing room is often in charge of a nurse who is attending on some children while the doctor is examining others, many of the children being weighed only and not needing the immediate services of the doctor.

Type E is an ante-natal department, and is similar to that required for general medical examination. Dressing rooms are essential. The doctor's room may, in this department, also be needed as a consulting room for private consultations, while the consulting room is used principally for normal examination of patients. The doctors may need a

separate small apartment adjoining, screened from it as a laboratory for urine-testing.

Light Treatment Departments—Such departments may be very large, especially when combined with various other types of electrical treatment; frequently, however, a small department is attached to general clinics, especially those dealing with children, where light treatment both of ultra-violet and infra-red ray types may be given. The essential accommodation for such a department is a waiting room with undressing accommodation, at least one main treatment room often used for collective treatment and two or more treatment and massage cubicles. Sometimes shower baths are provided in conjunction with the dressing accommodation, which necessitates duplicated dressing rooms if both sexes are likely to attend during the same sessions. The rooms needed for general treatment may vary much in size, being dependent on the number of persons attending each session. A control or operators' room is provided, separated from, but adjoining, the main treatment room, planned to contain certain types of electrical apparatus. Some of the apparatus used also necessitates insulation of the rooms from those surrounding and above it and although this demands various structural considerations in regard to finishings, it does not generally affect planning.

The small treatment rooms should not be less than 6 ft 6 in by 6 ft, but for general purposes they are much more satisfactory if rather larger, as a treatment couch occupies a considerable part of the area. It is usual to provide daylight to all rooms used for normal treatment purposes.

Figure 7 illustrates a typical light treatment department in a general welfare clinic principally for infant and children's use. The main circulation delivers into a departmental waiting room, around which are placed a lavatory and W.C.s, a shower bath, a waiting bench or seat and a number of dressing cubicles; this department is designed to be used by one sex at each period or for young children of either sex. The dressing cubicles are formed with partitions about 7 ft high, with either doors or curtains to close the entrance, the latter being considered sufficient by most authorities. The partitions between the cubicles may be of wood, metal, terrazzo or similar partition material, maintenance of cleanliness being the chief factor. The cubicles may be as small as 4 ft by 3 ft, but it is preferable if they are increased a little from those sizes to about 5 ft 6 in. A fixed seat is often provided in the cubicles, while the remainder of the equipment is usually a few hat and coat pegs.

The general light treatment room is approached from the waiting room and is often equipped with a low bench or platform on which the patients sit or lie. This bench is arranged round a central light source. Adjoining the treatment room, but not approached directly from it, is the control room, which has a small specially glazed observation panel between the two rooms.

A series of small treatment rooms are provided, each separated completely from the others. It is very desirable that these rooms should be of such a size that the treatment couch does not have to be placed against a wall, as circulation space for the operator is needed on all sides.

A nurses' room and doctors' room will be needed in conjunction with these rooms, but they need not necessarily be approached directly from the departmental rooms.

Dressing Rooms—In addition to the information given above for dressing cubicles, some clinics have rather larger dressing rooms, which may be used for general medical examinations as, for instance, in ante-natal departments. Figure 8 illustrates a

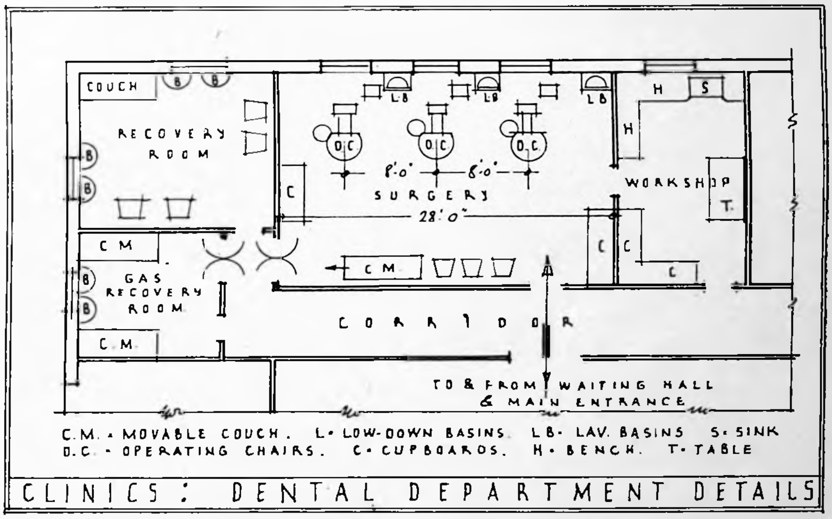


Figure 6

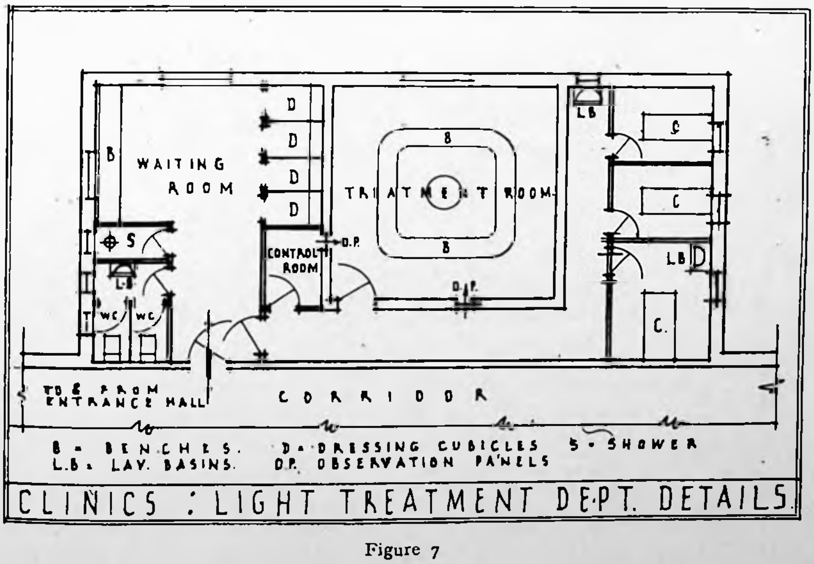


Figure 7

large general clinic where many patients have to undress. To avoid keeping the doctors waiting, a large number of cubicles are provided, grouped round each consulting room. The general waiting room, attached to which are lavatories for each sex, leads to the departmental waiting room; from this room the patient enters the consulting room and, if necessary, is shown into a dressing cubicle, where he or she undresses and waits until the consulting room is again free. After seeing the doctor the patient returns to his cubicle, dresses and enters the main circulation without re-entering the consulting room. In some schemes the consulting rooms are earmarked for one sex and consequently duplicated as shown on Figure 8, but in other schemes men and women use both consulting rooms, but attend at different times or on different days. Also in some schemes each consulting room has a

group of dressing cubicles on each side, so that both sexes may be dealt with at once. For children's use, especially for infants in charge of parents, a room without cubicles or similar divisions is sometimes provided for undressing. The sizes of the cubicles are approximately 3 ft by 5 ft. A door giving direct access from the consulting room to the corridor without entering either the waiting room or the undressing room is sometimes provided for the use of the doctor and nurses, but as an assistance to better and obvious circulation for patients it may be considered wise to omit such doors as in the example in Figure 8.

Tuberculosis Department — This department, when separate, usually follows very closely the lay-out suggested for a general medical department as outlined above and in Figure 8. In all larger clinics having a separate department for this purpose a separate waiting room should be provided. The waiting room should give access to a corridor from which are approached the nurses' room, dressing rooms and consultation rooms. A typical lay-out is to place a nurses' room centrally in a group of five rooms with a dressing room on each side of this central room, so that the nurses have control of the dressing rooms through a connecting door. Beyond each dressing room are placed the consulting rooms. Each dressing room in a busy clinic will require some six or seven cubicles to serve each consulting room.

X-ray Department—Small clinics are seldom provided with X-ray apparatus, and if this service is needed for patients, the latter either go to a central or main clinic or to a local hospital. In larger clinic schemes, however, the provision of X-ray is becoming general, not only for examination of patients but also for X-ray treatment. Certain precautions have to be taken to protect surrounding rooms from the penetrating effects of the X-rays, either by the use of lead lining to the walls, floor and ceilings, or by using barium plaster in similar positions, the former being an essential precaution for some types of apparatus ; such protection does not, however, affect the actual planning of the building to any very great extent. Although much of the work is carried out in normal daylight, light-tight blinds are usually needed in the main apparatus room. Most, if not all of the equipment, is usually placed in the X-ray room itself, but in some schemes a part is separated and placed in an operator's room adjoining the X-ray room and overlooking it by means of a small window about 20 in by 15 in, which is protected by lead-compound glass.

The size of the actual X-ray room is dependent mainly on the type and nature of the equipment needed for the particular scheme. Rooms vary in size from about 250 sq. ft. in area upwards, many rooms being about 350 to 400 sq. ft. It is desirable tha the room has one external wall in order to have natural daylight. The walls surrounding the whole department are generally at least 9 in thick. Corridors and doorways leading to an X-ray room should be sufficiently wide for stretchers to be handled easily.

In addition to the X-ray room itself there should be a number of auxiliary rooms. Leading directly out of the apparatus room should be a dark room, and in addition a patients' dressing room with cubicles. A waiting room is often provided where patients wait until they are required and during the time necessary for the development of photographs, to ascertain that results are satisfactory. The dark room should be connected with the X-ray room either by a dark lobby with two doors or by means of a special light-tight lobby without doors. The dark room should have a floor area of at east 50 sq. ft., and preferably rather more. The equipment of the dark room is usually very simple, and consists of a long bench or benches to form work tables, and a suitably large sink ; a number of shelves and racks are usually provided for storage of plate holders, chemicals and other supplies. A film store is needed, and should be planned with approach from the external air to eliminate fire risks ; this store should be enclosed in fire-resisting materials, and its equipment is composed of shelves and racks of various sizes to suit the materials to be stored.

The waiting room is normal and similar to those needed for other departments. The dressing room should be fitted with several cubicles as already outlined for other departments.

Figure 9 illustrates a typical X-ray department. This figure shows clearly which rooms need natural light, and

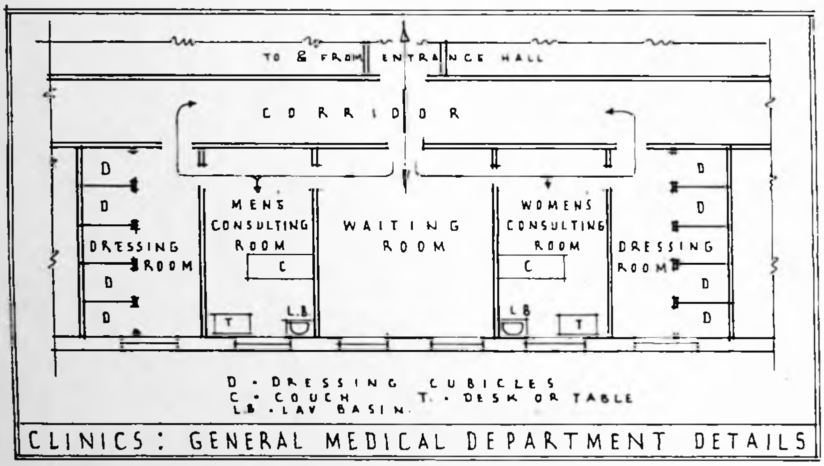


Figure 8

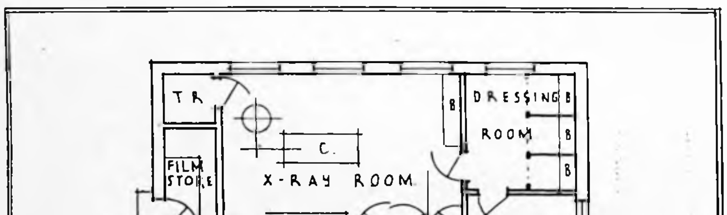


Figure 9

is in this example a separate wing attached to the main circulation corridor. The arrangement shown takes advantage of the three external walls for the placing of the main rooms, and at the same time the film store is placed conveniently near the department and is reached from the main corridor. The entrance from the main circulation is a wide corridor leading directly into the X-ray room for the easy handling of stretchers. Normally, patients enter the waiting room and pass to be X-rayed by way of the dressing room. Thus all the rooms to which patients go are close together, leaving the staff rooms together in another group.

Remedial Exercises—A room is often required for this purpose, and is generally similar to a normal gymnasium on a small scale. The equipment consists of the usual gymnastic apparatus, such as wall bars and beams as used in schools. The room should have an area of at least 400 sq. ft., and it is desirable that the height is not less than 10 ft. but it is better if much greater height can be provided up to about 16 ft.

In some schemes part of the main waiting hall is used at certain times as a gymnasium ; if space permits, the waiting hall may be provided with a folding screen to cut off the gymnasium portion, so that the two resulting parts may be used simultaneously, or, on occasion, the whole area may be used as a general waiting room.

Dispensary—Many clinics do not require dispensaries, as all medicines are made up by outside chemists. The larger schemes, however, can usually justify the employment of a full-time dispenser and consequently need a room or rooms for the purpose. A single room is sufficient for all but the largest clinics, which have, in addition, a store room. Good daylight is desirable. The equipment consists of a serving hatch for communication with the patients, a long working bench, one or two sinks, several cupboards and drawers and a large amount of shelving. The dispensary should be placed near the main patients' circulation on the route from consulting rooms to the main exit of the building. Waiting space is essential either in the main waiting hall or preferably in larger schemes provided independently near the dispensary.

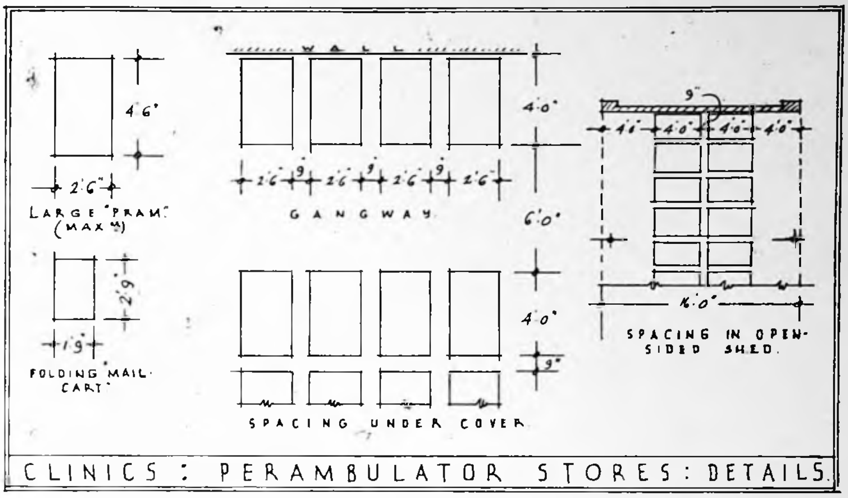


Figure 10

Food Sales—A small room having an area of 70 to 100 sq. ft. is often needed for the sale of special invalid foods. This room should have a small service counter or hatch connecting either to the waiting hall or to a recess formed in the main circulation corridor. If a counter is used some means, such as a shutter, must be provided to close the opening when it is not in use. The room needs to be fitted with a large amount of strong shelving of various sizes, and in large schemes a store room may be needed in addition. The floor area must be large enough for unpacking large cases, and also doors should not be too narrow to allow a normal packing-case on a trolley to pass through.

Refreshments—When refreshments are provided for sale to waiting patients, they are of a fairly simple nature and do not call for elaborate equipment. A small combined kitchen-servery, depending on anticipated numbers as to its size, will usually be found to be adequate. The equipment needed is generally a gas or electric cooker, tea urns, sink, draining board, refrigerator and considerable storage space for china and general storage, including food.

Perambulator Store—All clinics dealing with infants and young children and also those to which mothers may come and may have to bring children with them, should provide space in which perambulators may be left under cover, as it is undesirable to bring them into the waiting hall, nor should they be left haphazardly around the approaches to the building. It is essential that this storage space is under cover and it is important that protection from rain be provided for both " prams " and contents, such as bedding or wraps. It is better if the storage space is not only roofed but enclosed. Figure 10 gives the essential information for designing perambulator storage. The average perambulator needs a space about 4 ft long and 2 ft 6 in wide, to which should be added about 9 in for clearance. Gangways between rows of perambulators should be 6 ft wide to allow for turning space and for specially large types. The drawing also shows that if covered but open-sided storage is used the perambulators should be placed in the centre, with the roof overhanging about 4 ft from the fronts of the perambulators, which gives a 16 ft span for the double-sided type illustrated.

(*See also section :* " *Hospitals* (*General*) ")

NOTES

20. *Crematoria*

Introduction—There has been a very great increase in recent years in the number of persons desiring cremation. The Cremation Act, 1902, allows burial authorities (including local authorities) maintaining a cemetery under the Public Health (Interments) Act, 1879, to provide and maintain crematoria.

The first crematorium was opened in this country about 1885, at Woking in Surrey, and was followed by a number of others in various parts of the country during the next twenty years. During the last two or three years many crematoria schemes have been promoted, and many of them have already reached the building stage. Several of the earlier schemes were private undertakings, but some were operated by municipalities; among the recent schemes put forward many are in conjunction with municipally owned cemeteries, or are additions to the work of municipal cemetary committees.

The Site—The slection of a site for a crematorium does not often rest with the architect, although it should be given adequate consideration in town-planning schemes. No crematorium may be constructed within 200 yards of a dwelling-house without the consent of the owner and/or the occupier of the house, nor within 50 yds of the public highway; nor may it be placed in the consecrated part of the burial ground of any burial authority. There is nothing about cremation or crematoria which is detrimental to a district, such as smoke, fumes or noise; nor is there the same appearance as a cemetery, since it is usual to enclose most of the site from public view with either walls or tree screens. Also, compared with a cemetery, the area necessary is very much smaller. Sites should, however, be selected which will permit of a large open space or "garden of rest," columbaria and cloister-space sufficient to house the urns and memorials of the cremated over a very long period.

General Planning—Figure 1 illustrates in diagram form the essential circulations and relationships of the various parts of a crematorium scheme. It is most satisfactory to have one main entrance through which all persons and vehicles pass when going either to the crematorium or to the columbaria and garden of rest; but if there is likely to be continuous use and consequently very much traffic, it is sometimes better for vehicles to leave the site by a separate gate, although this involves duplication of control. The buildings should be sufficiently set back to permit the easy handling of vehicles and must be so arranged that vehicles proceeding to the main entrance to the crematorium are parallel with the entrance when stopping to set down passengers or to remove coffins from hearses. Ample car-park facilities within the site are essential and should be arranged in such a way that vehicles proceed easily to the park after setting down their passengers and can move away quickly from the car-park to the crematorium door to pick up their passengers after the ceremony. Vehicles other than those connected with deliveries and services only require access to the crematorium main doorway, or to set down passengers wishing to proceed to the garden of rest; the entrance courtyard and car-park should therefore be cut off from the remainder of the site, preferably by a wall, which may merely be a garden wall, or which may be part of the cloisters or columbaria. A service entrance is needed for fuel deliveries, if solid fuel is used and for services in connection with the building (repairs and extensions), gardens and for work connected with the erection of memorials and additions to the columbaria.

The diagram does not make any reference to offices or administration rooms, though such rooms may be required at the crematorium itself. Frequently, however, offices are in a more central situation in the town, in order to be more convenient for those having business with the crematorium authorities. Sometimes there are already offices in conjunction with an existing cemetery authority.

Figure 1 does not show any detail in regard to the crematorium itself, but it may be seen that access is required from the building to the garden of rest, and also from the furnace-chamber end to the columbaria and garden. It must be possible also to gain access to the garden without entering the building.

The garden of rest is an open space, usually mainly of grass, but having some planting to make it attractive especially in the form of trees near the boundaries. It is used for scattering the ashes of cremated persons —unless they are to be retained in an urn or are to be disposed of elsewhere, such as by burial. It is not usual to provide burial or grave space within the precincts of a crematorium in this country, although it is a general practice in some other countries. In some gardens, however, sites may be acquired for the erection of private memorials.

Covered cloisters are used to provide wall space to which memorial tablets may be affixed. These cloisters also provide covered space in which flowers may be assembled, and in which the people attending cremations may wait before and after the ceremony. Columbaria, which are permanent resting-places for the urns, may take a variety of forms, and will be discussed later in this series.

The principal compartment of the

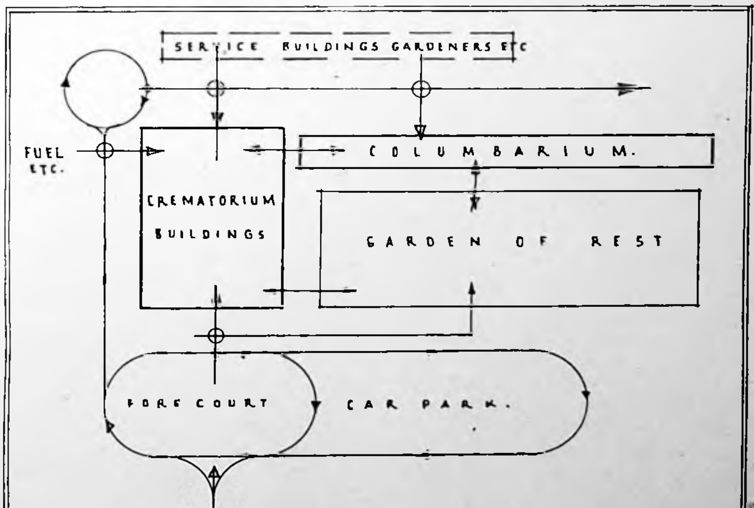


Figure 1

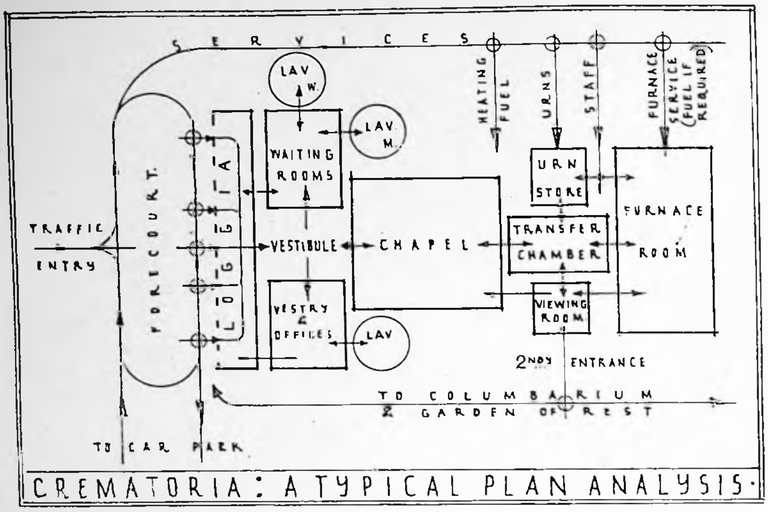


Figure 2

plan of a crematorium is the chapel, which should be approached directly from the entrance doors through an entrance vestibule ; it is general to orientate chapels so that the catafalque is at the east end, although crematoria are usually unconnected with any religion. The Cremation Act, 1902, exempts ministers of religion from the obligation to perform a burial service at or after the cremation of remains of any person. The body to be cremated is brought into the chapel, and rests on the catafalque during the service, after which it is passed into the transfer chamber. This room is used for preparing the coffin and its contents for transmission into the furnace, as, for instance, the removal of palls or other draperies and flowers. From the transfer room the body is moved into the furnace room, where the cremation takes place.

Other essential rooms attached to the three main rooms outlined above are waiting-rooms for mourners, vestry for clergy, offices, viewing room, urn store, heating chamber and fuel storage for the buildings and fuel storage or meters for the furnaces, depending on the fuel used for cremations. A small staff-room, lavatory and cleaners' store are usually needed.

At the entrance to the building there should be a long loggia or covered space. It is desirable that this should be very long, so that several vehicles may set down passengers under cover at the same time. There are usually a number of vehicles bringing the more important mourners of the funeral cortège, all of which may arrive together.

The waiting-rooms should be placed adjoining the entrance vestibule and have, if possible, separate approach from the entrance loggia in addition to the internal approach. Lavatories and W.C.s for both sexes should adjoin, or be placed very close to, the waiting-rooms. The vestry should have a separate approach from outside in addition to a door to the entrance vestibule or direct to the chapel. The vestry requires a lavatory and W.C. attached.

Plan Analysis—Figure 2 illustrates the essential rooms which go to make up the plan of the main crematorium buildings, together with the relationship of the rooms to one another and also the main circulations.

The coffin and the mourners arrive at the entrance, and should be able to proceed as easily as possible to the chapel through a main entrance vestibule. The waiting-rooms and vestry should have direct access to the vestibule, so that waiting mourners and clergy may meet the cortège as it reaches the vestibule. The chapel, transfer chamber and furnace room must be attached to each other as the coffin passes from the first to the last through the transfer chamber ; although these three rooms adjoin, they need not necessarily be on the same axis, as for example, on Figure 2 ; this point will be discussed in detail later in this section.

Adjoining the transfer chamber there should be a room or lobby from which the transfer of the body may be viewed by representatives of the family of the deceased. Consequently access is required from the chapel to the viewing room, but in addition external access should be provided. A door in the chapel is also desirable giving access to the garden of rest or to cloisters through which the mourners may pass after the service if they wish to see the wreaths which are removed from the coffin before the cremation takes place and to enable them to disperse so that the chapel may be used again within a short time for a further service. This door may, if desired, be incorporated in the plan as a secondary entrance coupled with the access to the viewing room.

Adjoining the transfer room there is usually a room for the storage of urns, both those for use and those which contain ashes awaiting removal to the columbarium or elsewhere. The urn store should also have direct communication with the furnace room.

The vestry can be a small room, about 100 to 150 sq. ft. in area, in which officiating clergy may put on vestments and await the arrival of the hearse and mourners. It is important that it should have external approach either from the main entrance loggia, as shown on Figure 2, or by means of a separate entrance vestibule or lobby. It should be possible to see the arrival of the funeral cortège from the vestry, so that the clergy may leave the vestry and meet the coffin at the entrance at the moment of arrival.

Main Entrance—Figure 3 illustrates two typical main entrances giving access to the chapel. Type A has a porch over the actual doorway itself, and Type B is in the form of a *porte cochère*, thus providing a considerable length of covered space. It is desirable that at least sufficient space in which to remove the coffin from the hearse should be under cover, especially for protection in wet weather ; the vehicles containing the mourners may then follow the hearse into the covered space to set down passengers. If a completely covered space is not provided, some form of porch is useful as a protection, since the entrance doors must remain open for long periods. Both diagrams on Figure 3 indicate wide approach steps at which vehicles may draw up. One step only is desirable at the entrance, to act merely as a pavement for limitation of vehicular traffic space and to ensure that sufficient room is left for pedestrians and for turning the coffin when it leaves the hearse to enter the building ; this step or pavement should not be less than 3 ft wide. The length of the *porte cochère* in Diagram B, or pavement each side of the porch in Diagram A should not be less than 34 ft long if proper space is to be provided for the hearse (with space to remove the coffin) and at least one other vehicle. A hearse is usually 16 to 18 ft long, and requires a space behind it of at least 9 ft 6 in for removing and turning the coffin. The *porte cochère* type, whether it is as long as is suggested on Diagram B, or merely provides a covered length of about 10 ft under which the coffin may be removed followed by the setting down of mourners from other vehicles, has very many advantages over a porch type, particularly if the porch is not open at the sides, as indicated on Diagram A ; if the porch is enclosed by walls at the sides, a further pavement space must be provided in front of it for pedestrian access each side.

Approach steps and, in fact, all other steps, except perhaps near the catafalque, should be avoided, since it is difficult to carry a coffin up steps. If steps are used, the sizes should be about 4½ or 5 in for risers and about 15 in for treads, so that the ascent is as gradual and easy as possible. Unless a *porte cochère* is used, piers or supports carrying roofs over the

entrance should be avoided, or else set back sufficiently far to prevent doors of vehicles from being damaged when opened, or from not opening sufficiently to allow passengers to leave the vehicle.

A *porte cochère* should not be less than 11 ft wide between the building and the inside face of the outer supports when the pavement or standing space is 8 ft wide, but it is very much better to allow for a roadway 9 ft wide and a pavement 4 ft wide; the outer row of supports should be placed on a pavement as a protection against damage to or by vehicles.

Entrance Doors—Entrance doors and any other doors that may be needed between the entrance and the catafalque should not be less than 6 ft wide in the clear to allow pairs of bearers carrying a coffin to pass through easily. More than normal height is not required for doors, as the coffins are carried shoulder high. Doors should be designed to open in either of the ways shown on Figure 3 in order to avoid any risk of bearers or mourners catching their clothes on projections such as handles.

The Chapel—The chapel has to provide sufficient floor space for the seating, clergy desk and the catafalque. The amount of seating required seems to vary considerably, some chapels having only about fifty seats and others as many as two hundred or more, while some continental examples are very much larger. The seating may be either in the form of fixed seats or pews, or chairs; the amount of floor space required for either type is approximately the same, and should be based on an allowance of 5 sq. ft., exclusive of gangways and similar clear spaces, although actually chairs require less space than fixed seating. The main gangway leading from the entrance to the catafalque should be at least 6 ft wide in the clear between seat ends or chairs to allow sufficient space for the coffin and bearers on each side.

The clergy do not generally require any fixed or special seating, and, indeed, often no seating provision whatsoever is made for them. A reading desk or lectern is required near the catafalque, from which the funeral service is conducted.

The chapel should be rectangular in shape, based on a plan shape usually adopted for ecclesiastical buildings. Good light is essential, and the general shape and finish of the room should depend on good proportion of height to length and breadth, avoiding elaborate decoration. Care should be taken to avoid a decorative scheme which is depressing, although a subdued and restful atmosphere is desirable. The climax of the decorative scheme should be the catafalque itself, on which the coffin is placed during the service.

There is a variety of ways in which the layout may be arranged in relation to the catafalque, which must adjoin the transfer or ante-chamber leading to the furnace or incinerating chamber. The transfer chamber may either be at the same level as the chapel or at a lower level; thus the coffin either slides horizontally into the transfer room from the catafalque, or descends to it on a lift. Both systems have been used in many schemes and appear to work equally well, each having advantages and disadvantages. The lift type involves the difficulty of closing the opening in the catafalque after the coffin has descended, while the horizontal type requires care in planning to avoid a possible view through the doors when the coffin is passing through into the transfer room. Figures 4 and 5 illustrate a number of general layout plans of chapels, showing the positions of the catafalque in each example. Few chapels make any provision for an altar or similar ecclesiastical fittings, principally because crematoria are non-denominational and not controlled or operated by religious bodies, although there are some examples where an altar is provided behind the catafalque or at the end of the chapel when the catafalque is placed on a side wall. It is possible to provide an altar in a recess which can be closed by doors or curtains when not required. Example A on Figure 4 shows the catafalque at the end of the chapel, with the door to the transfer chamber on the central axis; great care has to be taken to design, in keeping with the chapel, those portions of the transfer room which can be seen from any part of the chapel when the connecting doors are open, so as to continue the same decorative atmosphere. The doors between the chapel and the antechamber are generally of metal and a curtain is often hung behind them; this system does not seem so good as some of the others which are discussed later. The catafalque may be of wood, stone or metal, and is usually raised on one or two steps above the general floor level of the chapel. In the top

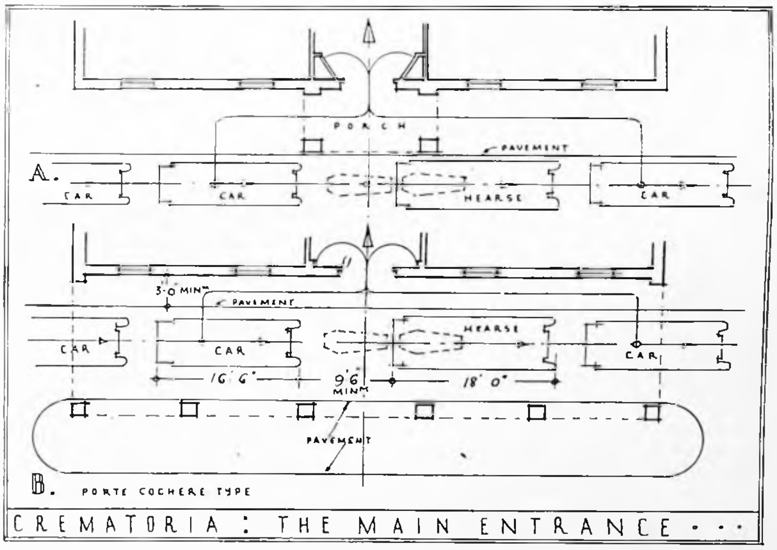


Figure 3

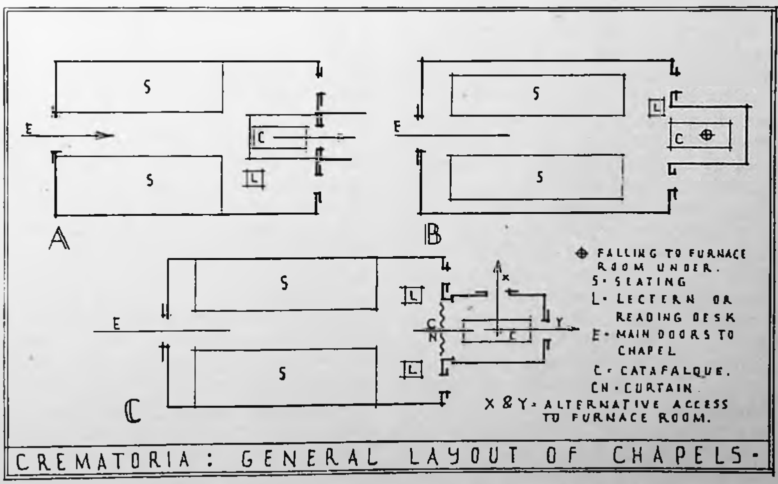


Figure 4

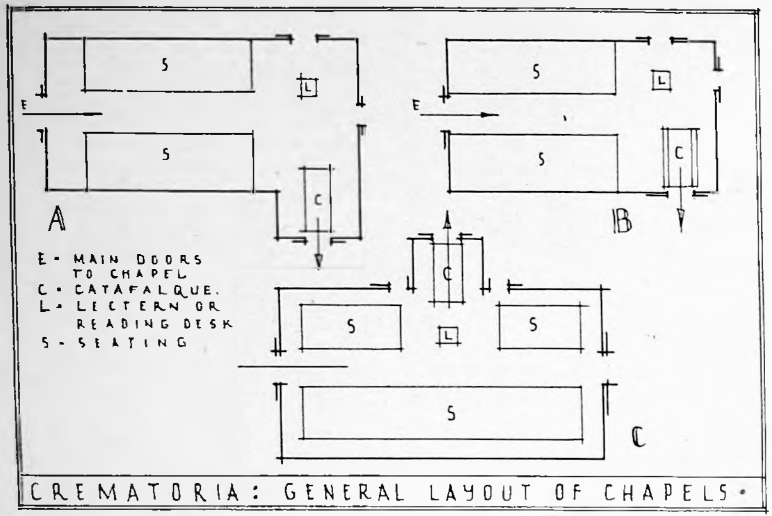


Figure 5

of those types on which the coffin moves horizontally are fixed rollers and other apparatus to move the coffin silently into the ante-chamber when required during the service ; the catafalque in this type requires to be about 10 ft long and 3 ft 6 in wide, although many are of larger sizes. It is essential that the coffin should be in full view of the mourners in the chapel and this is plainly impossible in plans such as that shown on Figure 5, Diagram A. The top of the catafalque is usually about 3 ft 9 in or 4 ft above the floor level surrounding it, since, if it is at a lower height, the difficulties of the coffin bearers increase. In those types with the anteroom below the level of the chapel the catafalque does not need to be quite so long as suggested above, since the centre part is a lift platform which moves and only requires the necessary screen wall thickness around it. The scheme shown in Figure 4 B, is based on a descending catafalque, and like Type A in Figure 4, is on the main axis of the chapel, but overcomes the difficulties of the view into the antechamber. The example shown in Figure 4C, seems to be one of the best solutions of the problem when the catafalque is placed on the axis, and it applies equally well to both vertical or horizontal transfer of the coffin. It is based on placing the catafalque in a recess which can be closed from the chapel by curtains which draw slowly across at the requisite moment in the service before the coffin moves from the catafalque ; after the curtains are drawn the coffin may be removed as desired to the furnace room by either of the alternative positions shown on the figure. The curtain avoids the sight of the automatic movement of the coffin either vertically or horizontally, and gives an increased impression of finality to the service.

Types A and B on Figure 5 have the catafalque placed on the side wall of the chapel ; this removes the possibility of seeing very directly into the transfer room when the doors open for the coffin to pass through. Type B seems better than Type A in some respects, since in Type A the coffin is not in full view of many of the seats in the chapel, although it may be claimed that the transfer chamber is more satisfactorily shielded.

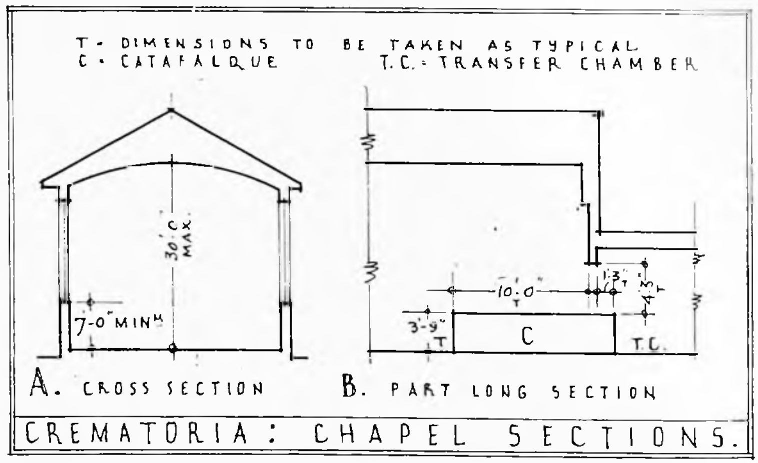


Figure 6

Type C is an alternative plan based on a change of axis ; the catafalque is placed on the short axis of the chapel with the seats facing towards it, while the entrance is on the end of the chapel. This scheme allows the mourners to pass to the seats without interrupting the passage of the coffin, by using the side and back gangways. It does not, however, give a much better view of the catafalque than is afforded in Type A of the same figure.

Each example shows the placing of the necessary access doors from the chapel to the transfer chamber and to the cloisters and garden ; it will be noticed that the positions have to vary according to the position of the catafalque and that those solutions in which the catafalque is set back, as for example, Figure 4, B and C, have the advantage that mourners do not have to pass near to the empty catafalque after the service.

As regards seating, side and back gangways, as shown in Figure 4 B and Figure 5C, are advantageous in allowing mourners to enter and leave more easily and with less disturbance to a solemn atmosphere.

The chapel is usually lit from side windows placed well above floor level in such a position that they do not interrupt any dado which may be used on the side walls. A minimum height of 7 ft above the floor to the sill is advisable for acoustic and other reasons. It is important that no window is placed on the same axis as the catafalque if it faces the public when seated or standing during the service. It is particularly desirable that adequate natural lighting should be planned to fall on to the catafalque ; when the catafalque is placed on a side wall, a window may be placed on its axis, but when the catafalque is on the main central axis of the chapel, windows should be designed on one or both sides.

For reasons of good acoustics, ceilings should not be more than 30 ft above the floor level of the chapel and are better at lower levels in small buildings, although care should be taken to avoid any feeling of insufficient height. If curved ceilings are used, it is important that the centre of the radius is below the floor level. For similar reasons elaborate or broken-up ceilings should be avoided. In connection with chapel heights it should be remembered that an organ is often installed, and it may be advantageous to place this at a gallery level ; in a height of 30 ft it is possible to provide an organ in a gallery placed at such a level as to allow clear headroom of 9 ft, so that it may be over the entrance doors to the chapel if desired. The blower plant is often placed in the basement. Sizes of organs vary very much according to the requirements, and it is consequently impossible to give useful dimensions in these articles.

Figure 6 illustrates a typical section of a crematorium chapel having a curved ceiling. The catafalque is placed about 3 ft 9 in above the normal floor level surrounding it, although one or more steps may be incorporated in the design of this fitting so long as they do not interfere with the coffin bearers when the coffin is being deposited on the catafalque. In some schemes in which the coffin is lowered to a basement furnace chamber, the top of the catafalque is at a much lower level ; some examples show as little as 12 in above the floor, but this is undesirable, since it is much more difficult for the bearers to place a coffin on a catafalque at a low level than at a level nearer to normal shoulder-height.

Organs are quite a usual requirement in crematoria and are placed in various positions according to the plan and decorative scheme adopted ; when placed in a gallery, space is required for an access staircase outside the chapel itself. If the organist cannot see the entrance, some means of communication such as a bell or buzzer is necessary between the attendant at the door and the organ. A similar means of communication is required from the clergy reading-desk to the transfer chamber to indicate at what point in the service the coffin is to be moved into the transfer chamber.

Transfer Chamber and Furnace Room—In some schemes only one room is provided for the dual purpose, but it seems desirable that separate rooms, divided by a screen wall, should be arranged, so that representatives of the deceased person may view the transfer of the body to the furnace without seeing the entire apparatus, which is of a practical nature and consequently unattractive in appearance. When two rooms are provided, the transfer or committal room is decorated simply but in character with the chapel, bearing in mind that representatives of the deceased may come into this room ; the furnace chamber, on the other hand, is purely utilitarian in design. The doors of the furnace chamber only show in the transfer chamber. It seems general in most recent crematoria to provide two furnaces, and these are usually so placed that they are not in view when the door behind the catafalque is opened, although this is usually carefully curtained. The placing of the furnaces is to some extent dependent on the type of fuel to be used and the position of the flues ; when overhead flues are used they may be placed so that there is at least 3 ft between furnaces, or between furnaces and walls or flues, in order to give access to controls and supplies at the sides of furnaces. Various fuels are used for the furnaces, such as coal, coke, oil, gas and electricity ; the most usual fuel in this country in recent installations appears to be gas, which is claimed to be the most easily handled and the most economical.

Furnaces seem to vary considerably in size according to each manufacturer, even when similar fuel is used ; for example, a gas furnace by one manufacturer is about 7 ft 6 in wide, 11 ft long and 8 ft high, whereas another manufacturer requires about 6 ft 3 in wide, 9 ft 9 in long and 13 ft in height. Typical sizes of three furnace chambers each having two furnaces installed are : 18 ft 9 in by 33 ft 6 in, 20 ft 6 in by 29 ft 6 in, and 28 ft by 30 ft—an indication of the considerable variations in dimensions which may be encountered. Figure 7 illustrates what seem to be good and adequate dimensions for a furnace chamber without a separate transfer chamber ; in this example there is a central flue with an incinerator on each side. At least 10 ft, and better 12 ft, must be provided between the wall through which the coffin enters from the catafalque to the faces of the furnaces ; in this space the trucks or trolleys on which the coffin is placed as it leaves the catafalque have to be turned and moved directly in front of the furnace doors. This dimension of 10 or 12 ft is therefore the minimum space required for a transfer chamber when it is provided separately from the furnace chamber.

It is desirable to have a space about 8 ft wide at the back of the furnaces and in addition there must be two or three small rooms or annexes in which may be placed an urn store, fan chamber and meter room. In addition to the 8 ft behind the furnace, it is also desirable to have space for a wide work-bench as suggested in Figure 7. The flue required from the furnaces may be taken anywhere desired, but it should provide about 35 ft of height above the furnace room floor level. This flue is usually incorporated into some part of the external treatment of the building, such as a tower. By the use of modern types of furnaces smoke is practically, if not entirely, eliminated and is unnoticeable from the exterior of the building.

Figure 8 shows a typical scheme with a separate transfer chamber. Access from the transfer chamber to the furnace room must be provided ; in this example a pass door is provided between the two compartments. As an alternative to Figure 7, this diagram shows the flues gathered to a main flue on one side of the furnace room. a space of 4 ft to 6 ft must be allowed between the furnaces where access is required between them, as in Figure 8. When schemes without transfer chambers are adopted, it is desirable to avoid doors connecting directly with the chapel as shown in Figure 7 ; either lobbies should be formed within the transfer chamber or else access should be provided by some other means.

The Columbarium— There are various methods of disposal of the ashes following cremation ; one of the

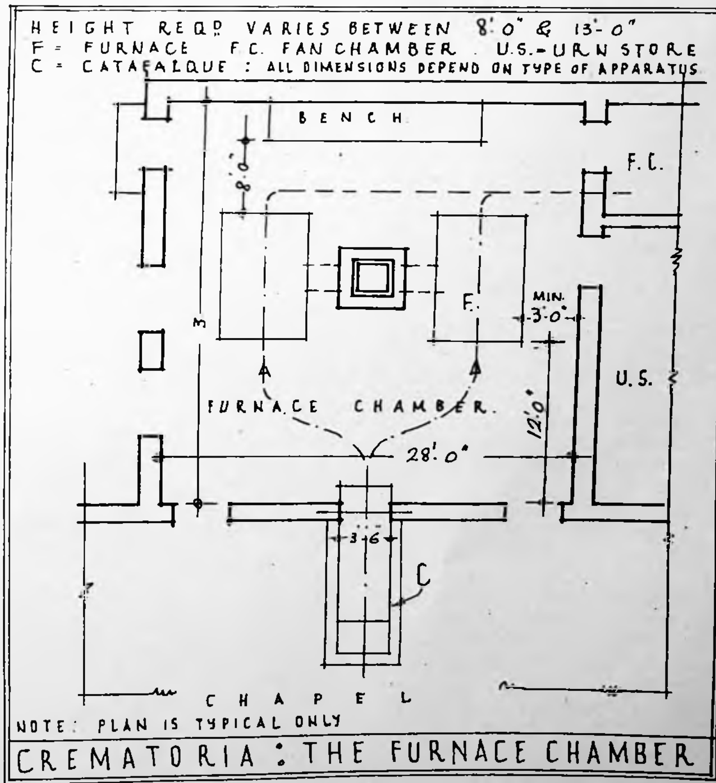


Figure 7

most general methods is to scatter the ashes in a Garden of Remembrance, and it is said that at least one-half of the ashes of those cremated are disposed of by this means. A few people still prefer to dispose of the urns containing the ashes by burial, and some ground—although usually only a small area—is often set aside for this purpose. Many persons prefer, however, to preserve the ashes in urns above the ground and special buildings called columbaria have to be provided for this purpose.

Of the various types of columbaria, some are enclosed buildings, while others are of the open-sided cloister type of building.

The urns used for the preservation of ashes are of many types and sizes, and some examples are of very elaborate design in marble, alabaster or bronze ; the most usual type is that known as the " box " type, which is rectangular in general shape and of rather greater length than depth. The columbarium has to provide niches or shelves in or on which the urns rest. In view of the fact that the box type of urn is most usual, the majority of the niches should be designed to hold them, with a space about 18 in wide, 18 in high, and 12 to 14 in. in depth. However, there must also be provision for urns of other shapes, some of which need heights of 2 ft and more. Provision should also be made for groups of urns belonging to members of one family, with accommodation for four and six urns.

The shelving or niches may be made of any solid and permanent material such as brick, stone or marble. In some countries abroad, where cremation is more usual than in this country, columbaria of many different types exist, some of which are most elaborate in the types of niches provided ; examples are to be found of brickwork in which are formed regular rectangular niches as urn containers, the front of the opening being covered with glass so that the urn may be seen, or by a standardised designed slab of stone on which the name of the deceased person is inscribed. The important factor is to design the niches in such a manner that orderliness in appearance is controlled and maintained, but to provide at the same time for the varying requirements in the matter of shape and size.

Figure 9 illustrates four types of columbaria. Diagram A shows the open cloister type with one side open to a garden—usually the Garden of Remembrance—but sometimes simply an enclosed courtyard or formal garden and the niches or shelves for the urns against the inside wall ; this cloister type has the advantage of providing covered walking and waiting space and may also be used for the display of wreaths and flowers. Diagram B illustrates a combined type, having a covered cloister on one side of the wall and niches on both sides, the second side being open to a garden. In the case of the use of niches in a wall not protected by a roof, it is desirable that, once the urns are placed in position, the front openings of the niches should be closed as a protection from the action of the weather by slabs of stone or, at least, glass.

Types C and D are similar in so far as they are both enclosed buildings ; the advantage of these types is that however much the designs of the urns vary, they do not detract from the general good design and orderliness of the grounds in which they are placed, since one must enter the building before seeing the display of urns. The main difference between the two examples is that in Type C the niches are placed round the outside walls, whereas in Type D they are grouped in the centre. A building of Type C must have the windows placed above the rows of niches, which are consequently placed in a bad light, whereas the light strikes directly on to the urns in Type D. Type D has, in addition, the advan-

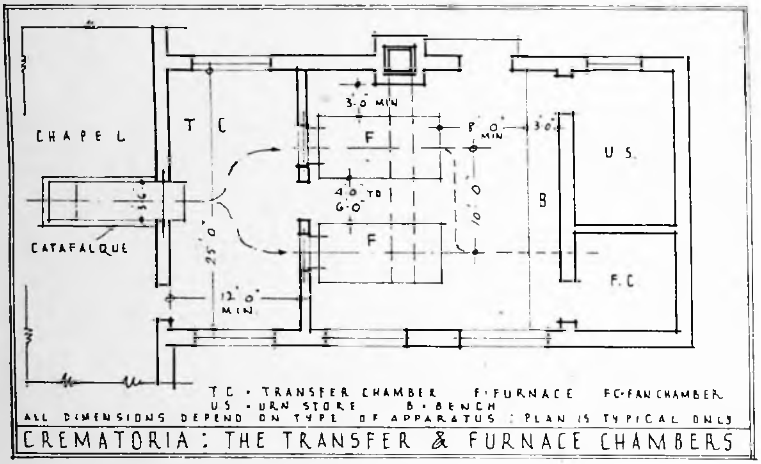


Figure 8

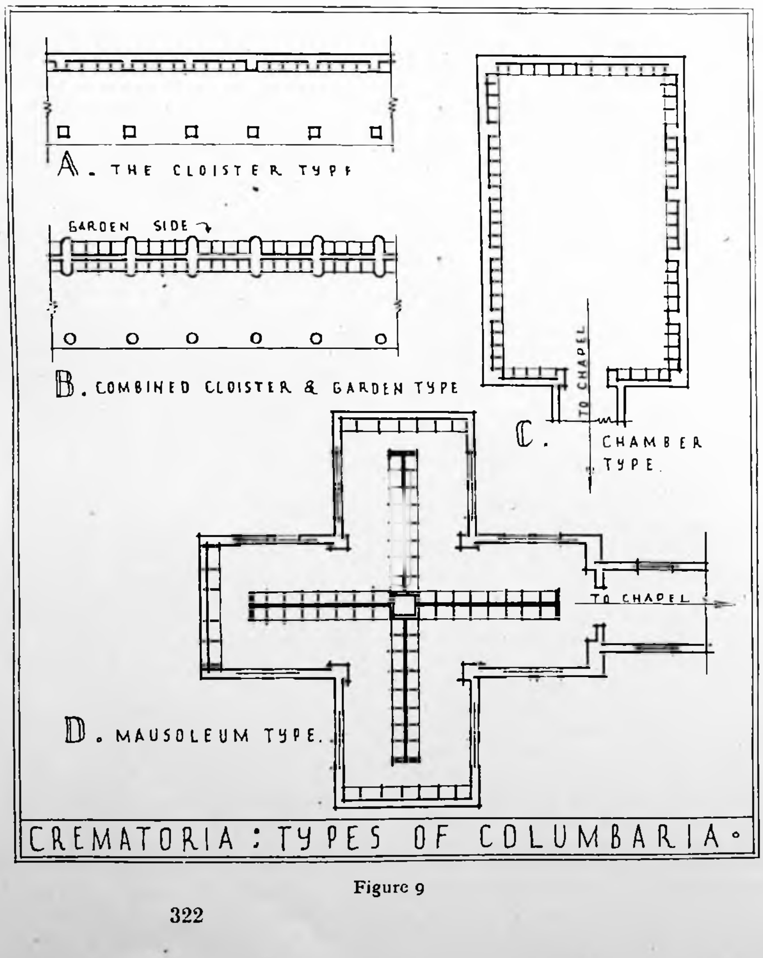


Figure 9

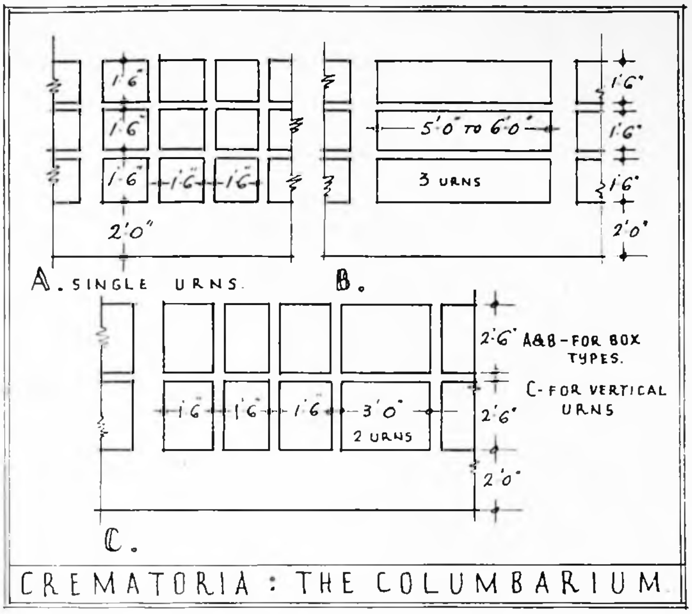


Figure 10

tage of distributing the visitors better and affording them more privacy, since they are not all assembled in the one central space as in Type C. Owing to the placing of the windows in Type C, a high building is necessitated. The front of the niches are sometimes left open and sometimes closed with stone, marble or glass slabs or metal grilles showing names, dates and other particulars of the deceased.

In placing the niches, it is advisable to place the lowest shelf at least 2 ft above the ground or floor level, and to limit the height to the top of the uppermost niches to about 7 ft 6 in, in order that the inscriptions may be read without discomfort.

Figure 10 illustrates some typical arrangements of niches for columbaria.

Memorials—Apart from the columbarium, space usually has to be provided for the fixing of memorial tablets ; wall space for this purpose may be provided in corridor connections between units, in cloisters or on garden walls. Garden sites for large memorials are usually available in the grounds of the crematorium, either in the Garden of Rest or places specially allotted for the purpose. Cloisters not only provide space for memorial tablets, but are also very useful for the display of flowers immediately following a cremation and at other times. The display and care of flowers are most difficult problems, and need very careful consideration ; relatives and friends like to send flowers not only at the time of the cremation, but also on other occasions, such as anniversaries and unfortunately it is most difficult to provide for the display of these flowers in an orderly manner, since they fade, or at least lose their freshness, very rapidly.

Offices—When main offices exist elsewhere, it is generally necessary at least to provide accommodation for the superintendent in charge of the crematorium, its staff and its records. Three small rooms are the most satisfactory methods of arranging this accommodation. Firstly, an office to which the public and those having business at the crematorium may go ; this should have a simple inquiry counter. Attached to the inquiry office should be a private room for the superintendent, with space for a desk and several chairs (120 sq. ft.) and adjoining the private room and with access only from that room should be a record filing room, unless all or the majority of records are stored elsewhere, for example, at the main offices of the burial authority.

The necessary outbuildings for the use of gardeners, such as glasshouses, tool sheds and stores, should be hidden as much as possible from all parts of the grounds used by visitors by means of cloisters, garden walls and screens of trees and shrubs.

Often lodges or cottages are required for at least part of the staff, but the planning of these buildings does not call for special comment in these articles, excepting that their grouping should be considered very carefully in relation to the other and main buildings of the crematorium itself.

21. *Lavatories: Public and Communal*

Introduction—This section discusses the planning of lavatories for public and communal buildings, such as factories, schools, office buildings. Consideration will be given first to general planning information which is applicable to all or most schemes and afterwards the accommodation requirements for each particular type of building.

In some buildings it is usual to place the lavatories apart from other blocks, either detached or cut off by ventilation lobbies, but in others the rooms simply open directly off corridors, which act as ventilation space. Lavatories should never open directly from rooms used for ordinary purposes; if a single private lavatory is attached to a private room or office, it must still be given, under normal conditions, a ventilated cut-off space.

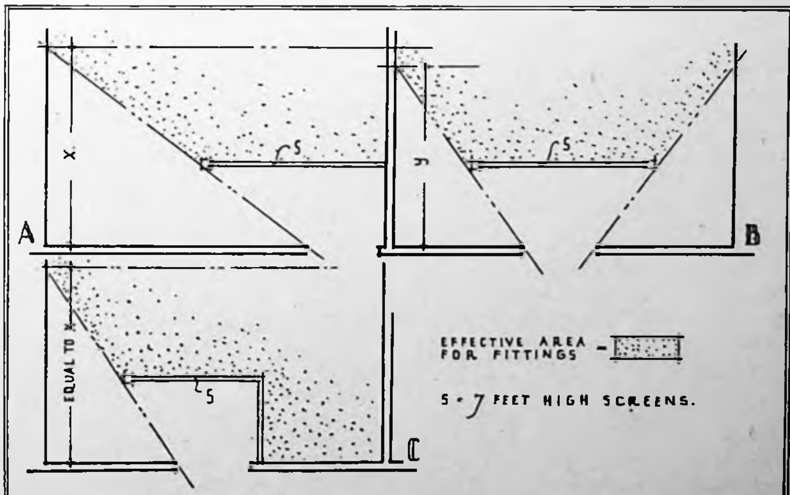
Screening—The approach to rooms used as lavatories must be properly screened from the approach corridor or other external space or circulation. The entrances may either be with or without actual doors. Figure 1 illustrates the general lay-out of screens necessary when no entrance doors are used and the three diagrams show the basic arrangement when the entrance opening is in a corner of the lavatory (Diagram A) and when the opening is in the centre of the room (Diagrams B and C). The diagrams show, by dotted hatching, the angle of vision into the rooms obtained by passers-by and consequently the parts of the rooms which are available for fittings. The greatest possible amount of usable wall space should be aimed at, as this is required for various purposes, either as space for fittings, or for towels, mirrors, etc. It should be understood that Figures 1 and 2 apply to rooms used as a lavatory apartment containing several basins and/or W.C.s and urinals; the W.C.s may, however, often be placed in a separate room approached through the lavatory itself. The open entrance types are generally called for in connection with factories and schools, where open-air or semi-open-air lavatory blocks are used. For large blocks the type shown in Diagram B is preferable as it permits separate entrance and exit and therefore better circulation. The minimum passage width either for openings or between screens and walls should be 3 ft, but if there are to be many users at any one time this width must be increased as considered necessary; it must, however, be remembered that the effective floor area is reduced as the size of the opening increases unless the screens can be correspondingly lengthened. The extra area available in Type C over Type B is great, but in rooms having large accommodation may not be worth the lack of convenience in circulations. The screens do not need to be more than 7 ft high and may even be reduced to 6 ft 7 in. It is better if the entrance screens commence from floor level, but they are often lifted up a few inches as an aid to floor cleaning, but this is to some extent dependent on circumstances and also on the material of which the screen is formed. The useful floor area of Type A may be increased by using a larger screen but there is generally no objection in most schemes if mirrors or towels are placed within the lavatory compartment where passers-by can see them.

Figure 2 illustrates types of entrances to lavatories where doors are used and are applicable in buildings such as offices and other buildings having internal approaches to the lavatory rooms. Doors in most cases should be self-closing and fitted with such furniture that a continual banging of the door on the frame is eliminated. Doors should not be less than 2 ft 8 in wide and wider, if necessary, for large rooms used by many persons.

Types A and B are similar in most respects, the difference being that a screen is provided behind the door in Type A instead of the door stop only as in Type B; the latter may in time damage the door; alternatively, frequent renewals of the stops are often necessary: Type A also has the advantage of slightly more wall space, having the area of the back of the screen as an extra wall. Both of these types have the entrance in the corner of the room, and it should be noted that the whole area of the room in both types is completely screened from view, dependent on the length of the screen opposite the door being made sufficient to control the angle of vision as indicated on Figure 2.

Types C and D have the entrances placed centrally in the room and differ in the method of screening. In Type D the screen is isolated for circulation reasons, but this method is only possible when the door may open into a lobby, adjoining room or corridor, as it must be a double swing door. This door must be partly glazed to avoid accidents and in many positions it could not be used, as it would swing open into traffic ways and thus be extremely dangerous. Neither Types C nor D are as economical with regard to effective floor area in the room as Types A and B and there is very much less wall space which can be used if complete invisibility of all fittings and equipment is to be attained.

Type E has the doorway recessed back from the corridor wall face as shown and thus reduces the amount of screen necessary. The door must be hung on the side shown and have either a door stop or an extension of



LAVATORIES : ENTRANCES WITHOUT DOORS :

Figure 1

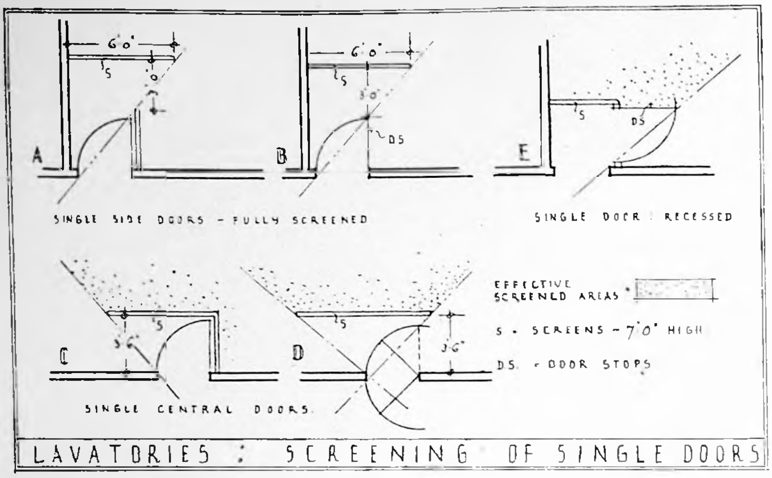


Figure 2

the screen to prevent it opening more than a right angle. The screened area is not as great as in Types A and B. The addition of a door on the corridor wall face serves little or no useful purpose and may tend to hamper circulation. The doors on all these types should be the full height of the opening and should not be cut off short of the frame at the top or bottom, except when in such positions that persons of the opposite sex do not approach near the doors, as would be the case in lavatories attached to the changing rooms of public baths.

Figure 3. A illustrates a type of entrance with double doors which must hang folding and not double-swing unless they open into a lobby, ante-room or cloakroom. It is very important that the space between the doors and the screen is of such a width that there is about 3 ft clear between the screen and the door edge when open, as shown on the figure. The screen itself needs to be very long unless the effective floor area is to be reduced very much from its possible maximum. The width of the passage-way at the end of the screen should be rather greater than the width between the screen and the open door. This type is very useful for lavatories with large accommodation to be used by many persons.

Type B on Figure 3 shows a type with a cut-off lobby from the corridor; if the two doors are placed far enough apart complete screening is possible when the doors are hung on the opposite hand and the inner one does not open more than a right angle. The lobby may be lighted by glazing the inner door with obscured glass, and, if considered necessary, either or both the upper part of the inner wall or the outer door may be glazed in addition.

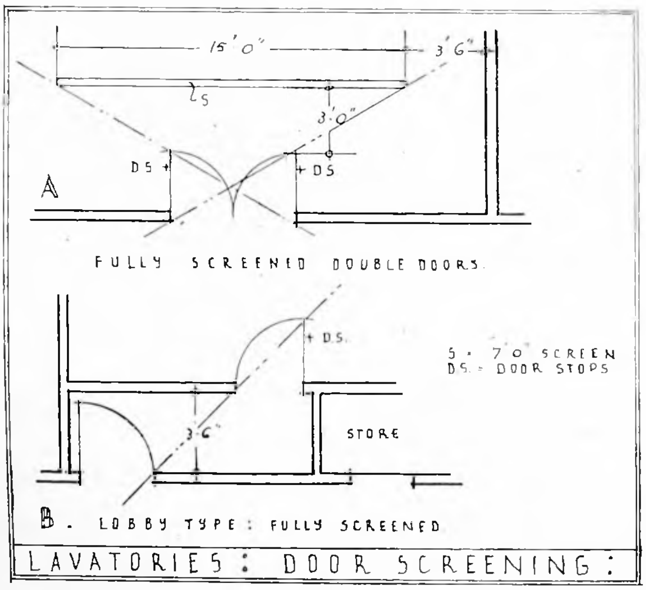


Figure 3

Circulation—Lavatories should be arranged to give some kind of general circulations as, for example, those shown in Figure 4, which are first to the urinals and W.C.s, then to lavatory basins, and afterwards to towels, mirrors, brushes, etc. The mirrors and hair and clothes brush shelves are often placed over the wash basins, but this placing tends to cause the basins to be occupied by one person for an unnecessarily long period and if the two groups are placed apart, both may be used at the same time by different sets of persons; in lavatories for women this is particularly important and, in many, make-up or dressing-tables are necessary in conjunction with the mirrors. The method of providing towels varies much according to the type of building; in some, roller towels are installed, in others separate towels are given to each person; in many offices and similar buildings each person has his own towel and brings it with him to the lavatory, thus no towel space is needed; some factories use paper towels from containers fixed on the wall, which, once used, are destroyed, while some others install mechanically driven hot-air dryers.

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With regard to partitions between W.C.s; in many buildings it is the general practice to use screens 7 ft high and thus ensure continual ventilation from one or two large windows lighting the whole lavatory apartment; but in some places and in some types of building a separate window is still provided for each W.C. and, in addition, some other windows for lighting and ventilating the remainder of the room. Separate windows necessitate planning W.C.s on external walls only, which creates a great limitation when planning the room as a whole. The design of the windows themselves should have greater consideration than is sometimes given; ordinary side-hung casements and double-hung sashes are often closed when the W.C. is in use owing to visibility from outside, and then not opened after use; but if the windows are of the hopper type, especially with side wings, and glazed with suitable glass, visibility is completely controlled and windows may be left open permanently. All lavatories must have some form of permanent ventilation unless mechanical ventilation is installed; this ventilation may be provided in various ways,

the most usual being either by means of air bricks or similar ventilators, or by glazing specially a part of the window with wire mesh or glass louvres. W.C.s with low partitions must not be placed in lavatories which have neither a ventilated lobby nor which open into an unventilated corridor; if there is no suitable lobby or corridor the W.C. partitions must be carried up to the ceiling, and each W.C., or the group of W.C.s, ventilated separately from the lavatory, which itself thus becomes the ventilated lobby. The most satisfactory position for windows in lavatories seems to be above wash-basins and urinals, but care must be taken to place them at suitable heights above the floor.

The lay-out shown in Type A, Figure 4, also shows a cleaner's cupboard with a sink; these cupboards should be placed near lavatories in order to use the same service pipes, wastes, etc. When placed in a position as shown, the access door may either be direct from the corridor or from the lobby at the entrance to the lavatory, but when placed in the latter position an additional door in the lavatory is often necessary to form a complete cut-off lobby, as the cleaners and the users of the lavatory may not be of the same sex. The cupboard should, in either case, be ventilated into the lavatory and may be lighted by a borrowed light between the cupboard and the lavatory.

Figure 5 illustrates the sizes required for W.C. compartments, which are based on fittings of average sizes for use by adults; the dimensions of fittings may vary very considerably. A width of 2 ft 6 in should be considered to be the absolute minimum, but for average class buildings 2 ft 9 in should be taken as a minimum. The length of the compartment varies according to the type of fitting, the placing of the flushing tank and the size of the door. The absolute minimum length should not be less than 4 ft 6 in, but this necessitates the use of a door 2 ft 3 in wide and leaves very little clearance between the door and the seat, and consequently very little space in which to stand while opening the door. For average planning the minimum length of the compartment should be taken as 5 ft and doors should be 2 ft 4 in wide. The remainder of Figure 5 is devoted to three illustrations showing the effects of the placing of the flushing cisterns in varying positions, and of the lengths of the fittings from the wall faces to the front edges of the fittings. Type A shows the normal type of W.C. with an overhead water waste preventer connected together with the normal flush pipe on the wall face; incidentally, both the water waste preventer and the flush pipe have to be placed on a side wall when windows are used in each W.C. compartment on the back wall, whereas the low-down cistern types may have windows over them and are consequently generally tidier in appearance. Type B in Figure 5 shows the space occupied by a W.C. with a low-down type of water waste preventer; the latter vary a little in height and placing above the seat, which affects the overall length of a compartment a little. The low cistern suite is about

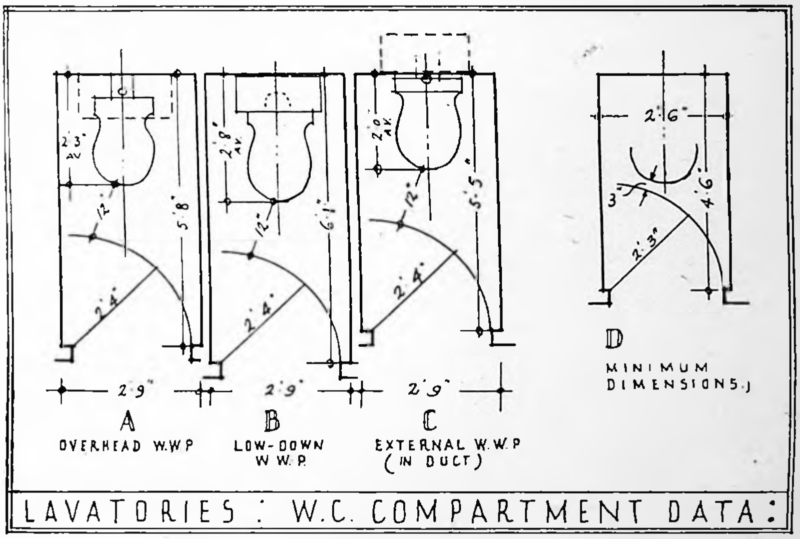

Figure 5

5 to 6 in longer overall from the back wall, which necessitates a similar increase in the overall length of compartments. Type C shows a normal type W.C. plan with a "P" trap, which can be placed closer to an external (except on ground floors) or duct wall, if the outlet is taken straight through the wall, than when an "S" type is used as in Type A. The other point shown in Type C. is the placing of the water waste preventer at a high level and outside the compartment and within a pipe duct behind the wall or partition, against which the W.C. fitting is placed; this method overcomes unsightliness of the flushing cisterns and pipes and is again improved if continuous trough flushing cisterns are used to serve a range of W.C.s. The placing of the flushing tanks in the ducts also assists in the reduction of noise.

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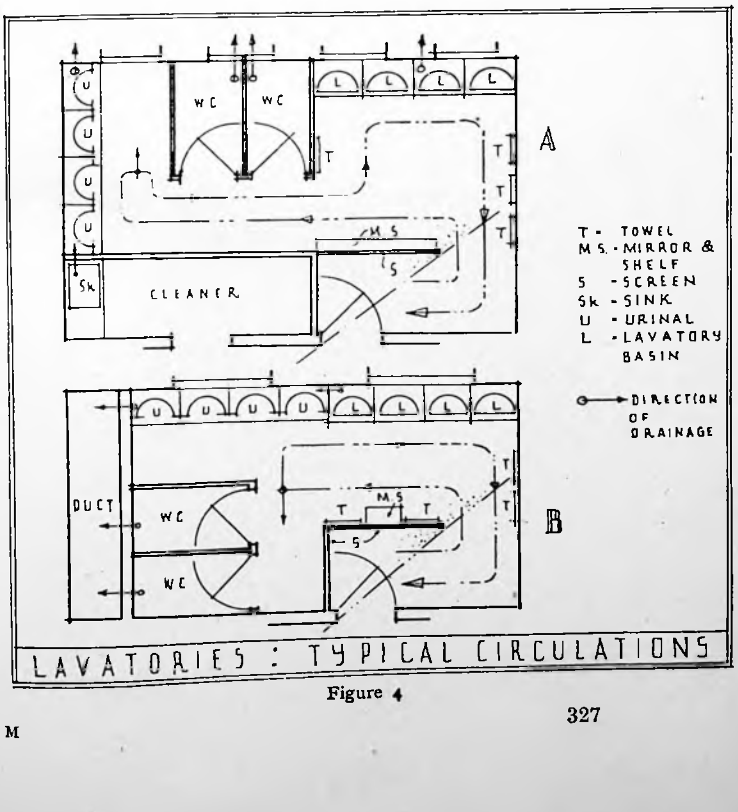

Figure 4

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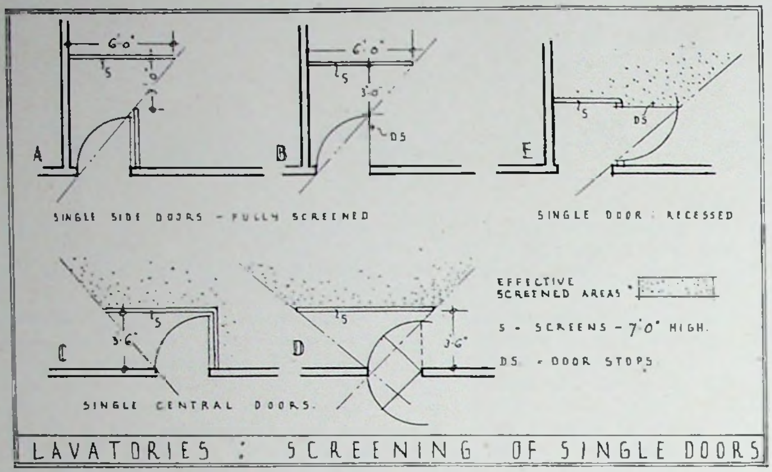
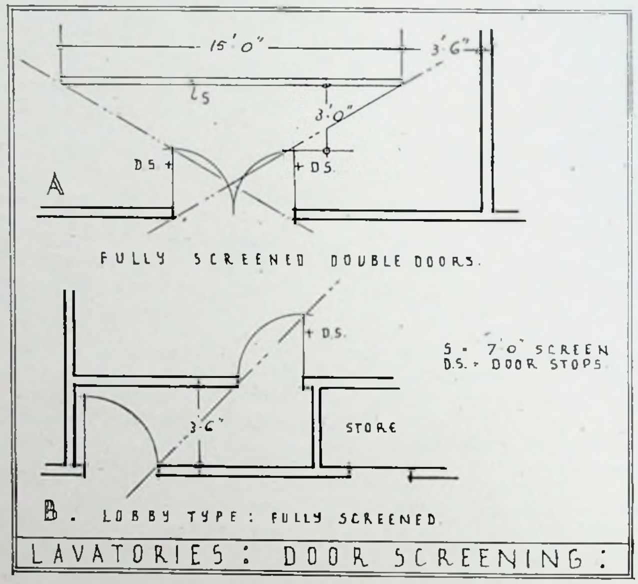


Figure 2

the screen to prevent it opening more than a right angle. The screened area is not as great as in Types A and B. The addition of a door on the corridor wall face serves little or no useful purpose and may tend to hamper circulation. The doors on all these types should be the full height of the opening and should not be cut off short of the frame at the top or bottom, except when in such positions that persons of the opposite sex do not approach near the doors, as would be the case in lavatories attached to the changing rooms of public baths.

Figure 3. A illustrates a type of entrance with double doors which must hang folding and not double-swing unless they open into a lobby, anteroom or cloakroom. It is very important that the space between the doors and the screen is of such a width that there is about 3 ft clear between the screen and the door edge when open, as shown on the figure. The screen itself needs to be very long unless the effective floor area is to be reduced very much from its possible maximum. The width of the passage-way at the end of the screen should be rather greater than the width between the screen and the open door. This type is very useful for lavatories with large accommodation to be used by many persons.

Type B on Figure 3 shows a type with a cut-off lobby from the corridor; if the two doors are placed far enough apart complete screening is possible when the doors are hung on the opposite hand and the inner one does not open more than a right angle. The lobby may be lighted by glazing the inner door with obscured glass, and, if considered necessary, either or both the upper part of the inner wall or the outer door may be glazed in addition.



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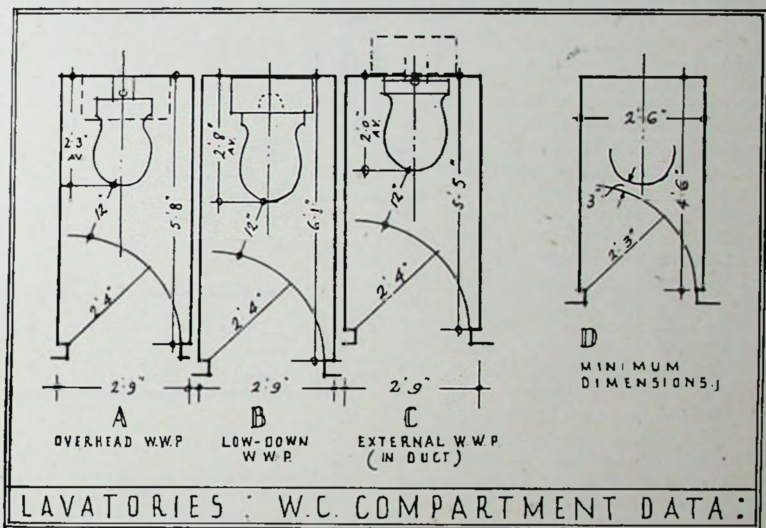

Figure 5

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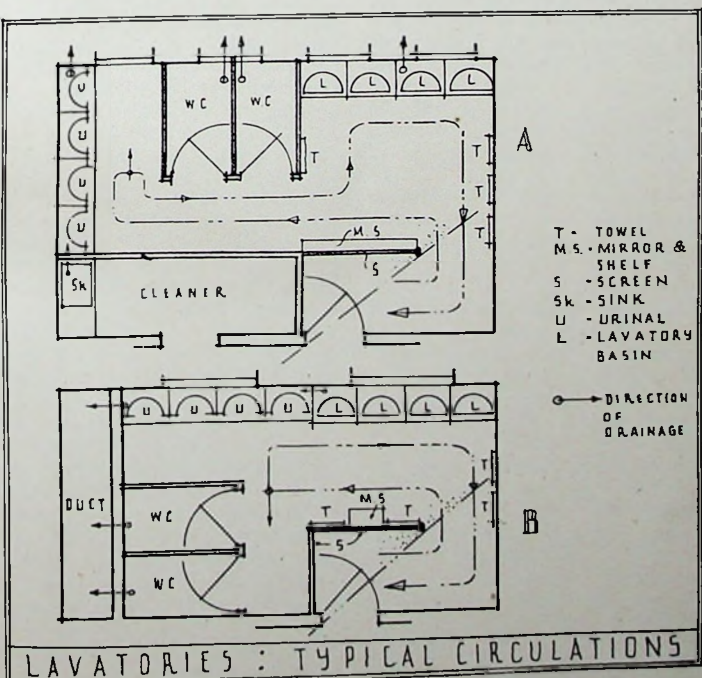


Figure 4

M

all factories and workshops. The numbers are largely dependent on the dirtiness of the trade concerned, but it must be remembered that the periods in which the washing has to take place are generally short and many persons have to be accommodated within these short periods.

Places of Public Entertainment—Regulations are generally laid down by the licensing authority. The London County Council requirements quoted below are fairly general.

If required by the Council, each part of the premises used by the public shall be provided with W.C. and urinal accommodation approximately in accordance with the following scale :—

Water Closets—For males : One water closet for the first 200 or part thereof ; two water closets for 200–500 ; three water closets for 500–1,000 ; and an additional water closet for every 500 or part thereof over 1,000. For females : One water closet for the first 100 or part thereof ; two water closets for 100–250 ; three water closets for 250–500 ; and an additional water closet for every 400 or part thereof over 500.

Urinals—In each part of theatres and music-halls, one urinal stall for each 50 males. In each part of dancing halls, concert halls, restaurants and cinematograph halls, one urinal stall for each 100 males.

For the purposes of this regulation it will be assumed that the public in each part of the premises consists of equal numbers of males and females, except that in certain premises it may be assumed that a percentage of one sex will invariably be greater than that of the other sex. In addition to the above provisions for the public, separate W.C. and urinal accommodation must be provided for the staffs, employees and the performers.

With regard to restaurants, public-houses, beer-houses and all similar places of public resort adequate sanitary accommodation must be provided ; the Public Health Act, 1936 makes special reference to such provisions.

Office Buildings — There appear to be no special regulations regarding office buildings, but it is suggested that the provisions should be at least equal to those required for similar numbers in secondary schools. It is sometimes possible to obtain a schedule of the number of staff of each sex on which the accommodation may be based, together with provision for possible future increases in numbers. Where a schedule is not obtainable the number of occupants is sometimes estimated on the basis of one person per 60 sq. ft. of usable floor area, and it may be assumed, except in special circumstances, two-thirds of the number of persons will be men and one-third women. Additional lavatories should be provided for the use of principals apart from the normal staff requirements. A good general provision of W.C.s for males is one to every 15 persons, up to 30, and 1 for each 25–30 persons after the first 30, with a similar number of lavatory basins and urinals on the basis of one for every 20 up to 40, and one for every additional 30 persons. For females, W.C.s should be provided at the rate of one for every ten up to 20, and an additional one for every 20 thereafter, with lavatory basins on a similar basis.

Schools—The sanitary accommodation required is set out in the Building Regulations and Memorandum issued under the Education Act, 1944, and covers all types of school.

The requirements for primary and secondary schools are as follows : for boys—One W.C. for every 25 pupils up to a total of 200 and one for every 30 where the numbers exceed 200. The minimum is two W.C.s. One urinal stall for every 10 boys up to a total of 100 with one additional stall for every 12 boys where the numbers exceed this figure. The minimum provision is three stalls. For girls—One W.C. for every 10 girls up to 100, one for every 15 girls of the second hundred and one for every 25 girls where the numbers exceed 200. In mixed schools it is usual to assume equal numbers of boys and girls.

Lavatory basins should be provided at the rate of one for every 8 children for the first hundred pupils, thereafter one for every 10 between 100 and 200, and one for every 12 for any numbers over 200.

The requirements for nursery schools are one W.C. for every 6 children and one lavatory basin for every 5 children where the ages do not exceed five years ; for infants' schools (over five and under seven years), one W.C. for every 8 children and a similar provision for lavatory basins.

Technical Schools : sanitary accommodation should be based on the requirements for other types of school, as given above, but additional lavatory basins should be provided for use in connection with workshops. If departments are planned at some distance from the main lavatory accommodation, departmental provision should be made.

Staff : Suitable accommodation is necessary in all types of school for the teaching staff of each sex and should be based on the following :—

Staff of 3–6	...	2 basins	1 W.C.
6–9	...	2 basins	2 W.C.s
10–15	...	3 basins	3–4 W.C.s
16–25	...	5 basins	5–6 W.C.s

Boarding Schools : The total basic requirements are similar to those for day schools, but the accommodation should be dispersed suitably to meet the day and night uses.

Further details of the provisions to be made are given in the sections on "Schools" and "Technical Education."

Swimming Baths—Adequate sanitary accommodation is necessary in connection with all swimming baths, which may be based on the provision of one W.C., one urinal, and one basin for every 60 males, and one W.C. for every 40 persons, and one lavatory basin for every 60 persons : for females it may be assumed that the proportion of males to females is approximately equal. (See also section on "Open-air Swimming Baths.")

Various Requirements—Buildings such as lodging houses, hostels, and similar buildings of communal use, should provide on a basis similar to that required by boarding schools, as a minimum, but in many of such buildings the accommodation provided is on a rather more generous scale.

If a house, or part of a house, is let or occupied by members of more than one family, in most districts there are by-laws requiring a minimum provision of sanitary accommodation, which in the case of the L.C.C. is one W.C. for every 12 persons.

With regard to the many other types of communal buildings, it is seldom that particular regulations or requirements are in force, and it should be noted that for such buildings as hospitals the accommodation is dependent on the provision of at least two W.C.s in each sanitary unit attached to each ward, which is, of course, only used by those patients who are not confined to their beds. Two lavatory basins with the possible addition of another in each bathroom are usual for each ward unit.

In all communal buildings it is important that the minimum requirements be regarded as two sanitary fittings of each kind ; duplication in this way ensures service in the event of temporary breakdown of a single fitting.

22. *Covered Baths and Wash-houses*

Introduction—This section concerns the planning of indoor or covered swimming baths, the various types of special baths often planned in conjunction with bath schemes such as slipper, Russian and Turkish baths, and, in addition, the requirements of public wash-houses and is a companion to the section on open-air swimming baths. Many of the planning requirements and details of equipment of covered baths are similar to those necessary for open-air baths, but varied to suit somewhat different conditions. (See also Section 23).

There has been very great development in the planning and equipment of covered and open-air baths during the last few years, and recent examples are vastly different from the bath schemes built during the latter part of the last century and during the early years of this one. The majority of covered baths open to the general public are municipally owned and operated, while the remainder are controlled by schools, hospitals, clubs and similar private institutions.

The Baths and Wash-houses Act (1846) gave Municipal Authorities the right to build and maintain buildings of this type for public use. The Public Health Act (1936) in section 233 gives local authorities the right to make by-laws controlling various matters concerning the conduct of swimming baths, whether open or covered, which are not under their own management (privately owned or operated); these by-laws are in respect of purity of water, adequacy and cleanliness of accommodation, conduct of users and prevention of accidents. This section of the Public Health Act does not apply to municipally managed baths.

Alternative Uses of Covered Baths—In the past, most covered baths had to be designed for alternative uses in the winter months; many municipal baths are converted into public halls for such purposes as concerts, plays, dancing and public meetings. The Ministry of Health now recommends that covered baths should be kept open in winter months. There is no doubt that it is almost impossible to design a building which will serve properly two such contrasting purposes as a swimming bath and a concert hall, and consequently when both uses are demanded one or other of the purposes must be badly served. The shape of a swimming bath hall is not the most suitable for a concert hall, nor can the acoustics or decorations be suitable for both uses. Swimming pools call for hard impervious materials which make good acoustics impossible for concerts or public speaking. The only alternative use which seems in any way reasonable is to use the bath hall for a covered playground for games and indoor sports such as badminton, tennis, or boxing. When the bath hall is to be used for public entertainments or meetings many complications arise as the result of compliance with means of escape and similar regulations enforced by the licensing authority.

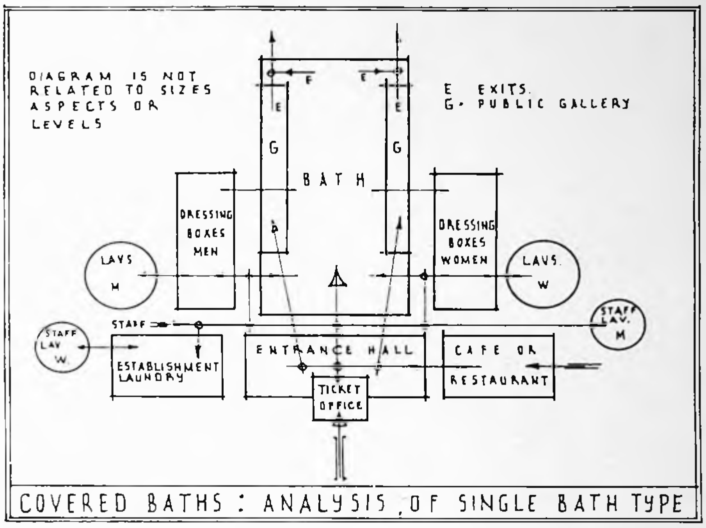


Figure 1

Sites—Covered swimming baths, except those attached to private and public institutions, are usually built in urban areas with fairly dense populations. As a rule their cost cannot be justified except where there are concentrations of population. The site need not be chosen in a position where land values are very high, as for instance in main streets, unless it is decided that the building is to be used also as a public hall. It is desirable that there should be good transport services in the vicinity giving rapid access to all parts of the town in which prospective users live. The site must be of adequate dimensions to take care of all possible future developments that may be necessary. It has frequently been pointed out that sites of inadequate size have been selected, resulting in costly construction and inefficient planning.

The site should have sufficient area to permit of car-parking and a draw-in for goods deliveries. If the building is to be used for public entertainments, space for alternative exits and the handling and parking of private cars and other vehicles should be carefully considered.

A secondary road approach is very helpful for service deliveries. When public wash-houses are incorporated with baths a suitable position for an approach away from the public baths entrance is most desirable, either at the side or rear of the building.

General Lay-out—The report of the special committee appointed by the R.I.B.A. in 1934 to consider the cost of public baths and wash-houses stresses very strongly the importance of good planning as the main factor in economy of cost. This report emphasises that indirect planning is expensive, not only in structure but on account of complications of services, while bad planning means costly construction and increased maintenance.

The building may require one swimming bath only, together with the necessary dressing accommodation and engineering services. Equally it may comprise two, three or more baths, for first- and second-class bathers and beginners, slipper baths for two classes of each sex, special baths for each sex and public wash-houses together with greatly increased service accommodation, including the establishment laundry.

Figure 1 illustrates diagrammatically the analysis of a covered bath scheme having only one swimming bath and no other types of baths or wash-houses. The figure shows clearly the important relationships between each of the parts. At the main or public entrance is placed the ticket office and towel store, from which bathers pass

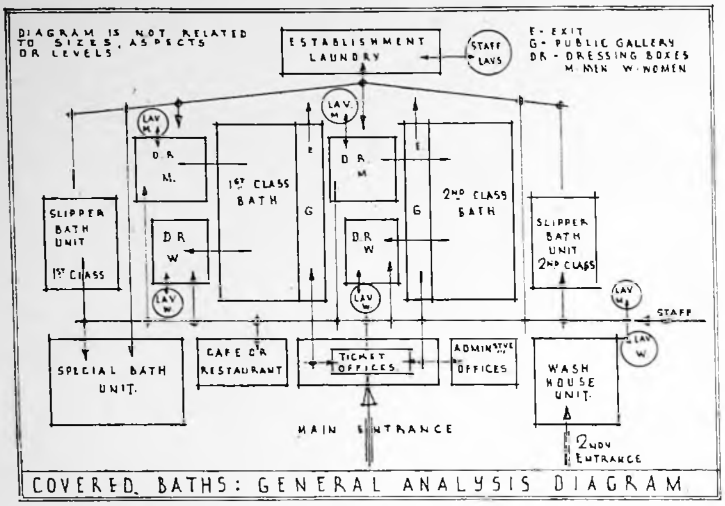


Figure 2

according to their sex to the dressing-boxes placed adjoining the bath. The swimming bath itself should only be accessible by passing through the dressing-rooms and any cleansing accommodation provided. If a spectators' space is needed, this should be accessible only from the main entrance hall wherever it is situated. Thus spectators and bathers are always segregated, which assists control and cleanliness of the establishment. Secondary exits are usually needed for the spectators' seating whether this is near the water level or in a gallery. Lavatories must be attached to the dressing accommodation of each sex for use of the bathers. Some staff rooms are essential for the use of the instructors and controlling staff, and also for the establishment laundry and engineering staffs. The establishment laundry, when possible, should be planned so that used costumes and towels may be rapidly passed from the dressing accommodation to the laundry and the clean towels, etc., easily returned to the issuing office. A café or restaurant serving light refreshments is often provided.

Figure 2 illustrates the general analysis of a large scheme having two swimming baths, slipper baths for two classes of each sex, a special bath unit providing for Turkish and similar baths for both sexes, a café and a public wash-house unit; the last, although often planned with the second-class accommodation, should be a unit separated from the remainder of the scheme excepting in regard to services, staff and administration. It should be noted that one main entrance is used to control the whole building except the wash-house unit, in order to reduce the controlling staff to a minimum; however, examples may be found where the approaches to each class are separate and even subdivided again into sexes, although the tendency is now towards a unified approach, especially as mixed bathing is now generally permitted in public bath establishments.

Entrances—As previously stated, it is desirable for the entrance hall to serve all parts of the building, however large it may be, excepting the public wash-house. It should be of ample area depending on the size of the building and it must be borne in mind that there may be large numbers of people requiring access to the building in a short space of time. The central element of the entrance hall is the ticket office together with towel and costume distributing office when these are combined; the two offices are sometimes separated in large establishments. In extensive schemes considerable space for the combined ticket office and towel distribution is required, with several issuing windows to reduce congestion. The administrative offices, and particularly the superintendent's office, should be approached easily from the entrance hall, although it may often be found economical to plan these on an upper level. The towel and costume store may sometimes be planned adjoining and at the same level as the issuing office, but in many schemes it has been found to be more economical to place the storage at a basement level with a small hand-lift connecting to the issuing office. It is generally found difficult to plan the laundry in close proximity to the towel store and issuing office, although this is most desirable when in any way possible. Some large bath schemes have the towel issuing offices adjoining part of the dressing accommodation, and are therefore in charge of the same attendants, especially when a similar type of locker or clothes storage system is employed, with dressing-boxes only in use during the actual period of changing clothes, and not for clothes storage during the period of bathing.

When the building is to be used for alternative purposes in winter time, the entrance hall must be planned in such a manner that it is suitable both in size and shape for the control of crowds, as at the commencement and end of concerts or public meetings. When such uses are contemplated, cloakroom facilities must be given consideration and specially planned for; such facilities are unnecessary when the building is to be used only for bathing purposes. The ticket offices and towel-issuing offices may also need special consideration for adaptation to the varied conditions. Some schemes have even had a separate entrance hall planned for use when the building is a public hall, with direct access to the main area of the bath hall, which is avoided if the building is used for its normal purpose when bathers should pass in the first place to the dressing accommodation.

The entrance hall should be designed to act as a cut-off for cold air and draughts entering both the dressing accommodation and the bath hall, if there is not an entrance vestibule. The finishes of the entrance hall should be selected for hard-wearing qualities, but they need not be impervious materials as in the damper parts of the building.

The pay-box itself should occupy a prominent position and one which is obvious from the entrance doors. It is customary to enclose the pay-box with glass above counter height, which is generally about 3 ft 3 in above floor level; this enclosure need not be carried up for more than a height of 7 ft or 7 ft 6 in above the floor and should have the necessary holes for the tickets, speaking and towel issue. Provision is usually made in the counter for ticket issuing machines, coin-change machines or cash registers, but even with these provisions a cash drawer is desirable in addition. The pay-box may be of minimum dimensions to accommodate one or more cashiers as required, if not used for towel distribution, but if used for the dual purposes much shelf space is required. The amount of shelf space needed depends entirely on the proximity of the storage space and method of delivery of supplies from storage to issuing counters. Shelves should be from 15 to 18 in deep, and spaced at approximately similar heights above one another; the lowest shelf should be at least 6 in clear of the floor. Figure 3 illustrates in diagrammatic form the entrance arrangement of a large swimming bath scheme having two swimming baths, slipper baths and special baths. There is a large rectangular entrance hall with a large pay-box and towel issuing office combined immediately opposite the entrance doors. Behind the pay-box is a towel and costume store with direct intercommunication. The towel store is fed from a lift in a service corridor in the basement where the establishment laundry is also situated. At each side of the pay-box are the approaches to the first- and second-class baths; these

approaches are shared by both sexes, who afterwards divide to reach their respective dressing accommodation.

At each end of the entrance hall are placed staircases, at one end leading to the slipper baths, which are situated on the floor level above the entrance, and at the other end leading to the offices and spectators' gallery overlooking the first-class baths. Spectators' accommodation is not usually provided in the second-class bath.

On the ground floor at one end of the hall is the café or refreshment room, so placed that it is accessible to all types of visitors to the building without entering any of the specialised groups of accommodation. At the opposite end of the entrance hall are the special baths which are placed on the lower level in order to be as near the heating plant as convenient to reduce the necessary services to a minimum. This general entrance hall lay-out allows a fairly free circulation in which congestion and cross circulation is reduced almost to the minimum. Figure 4 illustrates diagrammatically another large bath scheme, and is similar in many respects to Figure 3, excepting that the pay-box is somewhat differently placed, while the towel issuing takes place at the approach to the dressing accommodation instead of at the pay-box. By placing the pay-box at the entrance to the building the amount of cross circulation in the entrance hall is reduced, and the hall itself is more free as a waiting and circulating space, as well as permitting the whole of the long wall of the hall opposite the entrance to be used for the approach doors and corridors to the other parts of the building, which in this example is mainly of a single-storey type.

Figure 5, Diagram A, shows a smaller type of scheme having one bath only and some slipper and special baths. The combined pay-box and towel issuing office are central, placed in the entrance hall opposite the entrance doors. The towel issuing office is connected to a basement towel store by means of a small hand-operated lift about 2 ft by 18 in. At one end of the hall is the approach to the slipper baths; at the opposite end are placed the café and the superintendent's office.

In some schemes, especially when the entrance to the building is on the long axis of the entrance hall, the café is placed in the hall itself, so that the entrance hall becomes a general concourse or meeting place for the whole building. Figure 5 Diagram B, illustrates an example of this type which is a large scheme with two classes of bath. An entrance hall of this character will generally occupy a fairly large area, but it permits better and more direct circulation to all sections of the building, more especially as the two units may be placed on each side of the hall, as for instance, the first-class swimming pool on one side and the second-class pool on the other. The slipper baths are placed over the special baths.

Bath Hall—With the general acceptance of mixed bathing there is little need to provide separate baths for each sex, and even when segregation is specially desired, special times may be set aside for the one bath to be used by one sex only. Also, the provision of baths of two classes is considered by some to be of doubtful value, as one or other is likely to be used to a lesser extent.

It seems preferable to provide a special bath for children and non-swimmers, and even, in addition, a bath for the exclusive use of diving rather than baths for different classes. A shallow bath for children, preferably in a separate hall, has an advantage in that teaching does not interfere with the general use of the main bath. An alternative scheme which seems to offer certain advantages is to provide a separate bath for diving, and use the ordinary bath for all normal swimming.

Bath Sizes—The Amateur Swimming Association require a minimum length of 75 ft for championship racing, but they recommend a minimum size for a main swimming bath of 100 ft long and 42 ft wide; these dimensions must be of the water area of the bath itself, and must be exclusive of nosings, which should not project over the water area. It is desirable that the length of the bath should be a proportion of a mile. When one bath is to be provided instead of two of different classes, a large water area is worth careful consideration, using lengths of 120, 132 of 165 ft, and width of 48 or 60 ft. A width of 42 to 48 ft permits eight competitors to start a race together, and 60 ft allows for ten persons. The lanes are generally based on the provisions of 5 ft 6 in to 6 ft per swimmer in width. The lanes are usually marked on the bottom of the bath by coloured lines inlaid in the finishing material, but some swimmers favour the provision of cords supported by corks stretched along the surface of the water.

There are, however, certain factors

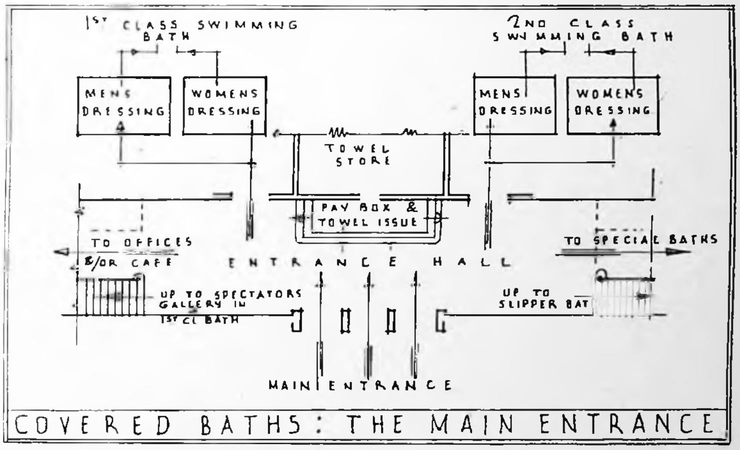


Figure 3

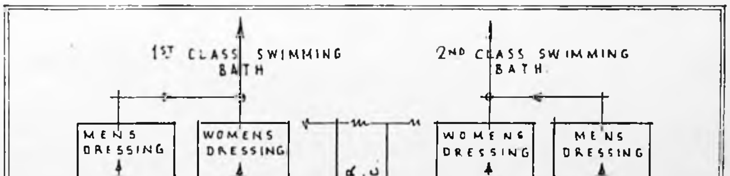


Figure 4

which should be borne in mind in regard to water areas which influence economy. In small towns, private communities and lesser bath schemes in large towns, a length of 75 ft will suffice for normal use, and, where galas are likely to be held, as in the principal baths of large towns, 100 ft is an economical length. The increase in width of the water area causes an increase in span which is usually much more costly than an increase in length, so that a width kept to 35 ft assists greatly the cost of any scheme, and often in small schemes it may be justifiable to reduce this dimension to as little as 30 ft, which can be used for six lanes, although the total space then becomes a little cramped.

Depth of Water—The depth needed for children and non-swimmers varies from 3 ft to 3 ft 6 in, and many schemes provide at least 3 ft 3 in Four feet is the absolute minimum depth desirable for any water area to be used for water polo and it is preferable if the whole polo area has a depth of at least 6 ft. The length of the water area for water polo is not less than 19 nor more than 30 yd, with a width not greater than 20 yd.

Figure 7 illustrates the essential information necessary for a water-polo playing area. The width is usually dictated by the full width of the bath, and the maximum of 60 ft is seldom likely to be obtainable in indoor or covered swimming baths. Generally, in order to provide the maximum depth of water, the playing area is kept to the deep end of the bath—a factor which should be remembered when arranging the seating needed for spectators on each side of the pool.

For normal purposes of swimming and diving a depth of 7 ft is essential over part of the water area, but, unless high-diving stages are to be installed (often this cost is unjustifiable), a maximum depth of 9 ft is sufficient, which is economical in excavation or where bad foundations are likely to be encountered.

When baths are to be used for diving championships the water depths must be increased greatly according to the height of the stages, which may vary up to 10 metres. The sections needed for baths where such stages are to be used are detailed in the Section on " Open-air Swimming Baths " ; the dimensions given should generally be considered as minima. (See Figure 7, Section 23).

Figure 6 illustrates three typical plans of different types of bath halls. Diagram A shows a single bath 100 ft long by 42 ft ; the surrounding walking ways, exclusive of any areas used by spectators or for access to dressing-boxes, not used after planning spaces for cleansing showers or troughs, should be at least 6 ft on the long sides and at the shallow end, and at least 12 ft at the deep end where diving-stages or boards are placed.

Diagram B shows a scheme having three baths in one large hall for swimming, diving and non-swimmers respectively. Six-feet widths are provided round the main bath, with 12 ft at each end of the diving-bath. One bath only then needs to have a greater depth than 8 ft 6 in or 9 ft. It should be noted, however, in a scheme of this type that the roof span is very large and the scheme may consequently be uneconomic on that ground, but, from the point of view of the users, the " three-bath " arrangement is probably ideal, especially for family use when the parents and older children may be in the same space as the younger and non-swimming members of the family, but their activities do not interrupt one another.

The scheme shown on Diagram C of Figure 6 has the advantages of separating the diving from the swimming, and at the same time has a much more economical roof span than scheme B. The division between the two baths may be either temporary or permanent and if the former the full length of the combined water areas is available for racing. The length of the water area of the diving-bath is dependent on the height selected for the highest staging, and may need to be at least 30 ft. This scheme also provides a minimum surround of a width of 6 ft, increased to 12 ft at the diving end.

Some covered bath halls, in recent years, have been planned with a large glass area on one long side of the bath either as a window or as movable screens opening on to gardens or paving ; if a plan of this type can be adopted by the nature and position of the site it adds greatly to the attraction of the bath, especially in warm weather when a normal top-lit covered bath hall becomes very humid. Seating for spectators in a scheme of this type will need to be placed on one side only, but some additional temporary seating can be placed adjoining the window wall. The opening windows or wall give bathers access to terraces and/or lawns where they

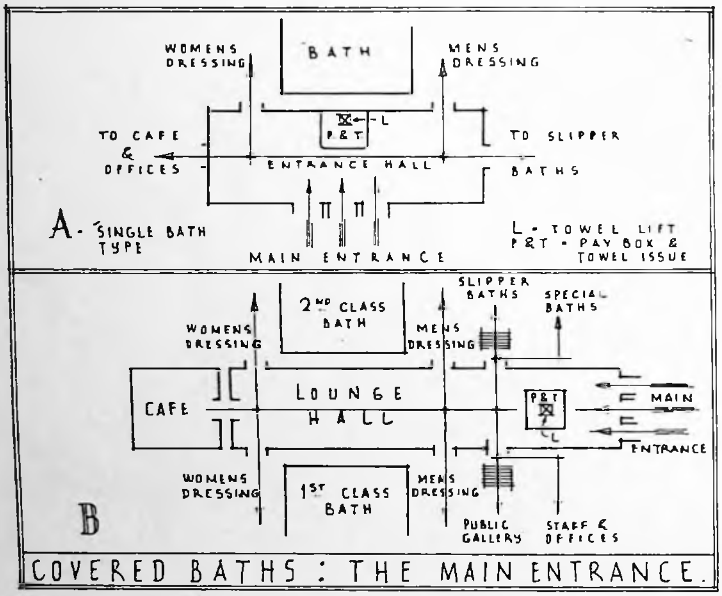


Figure 5

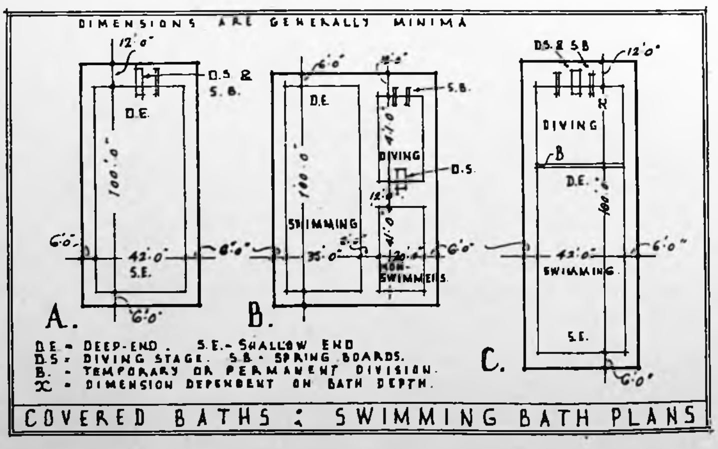
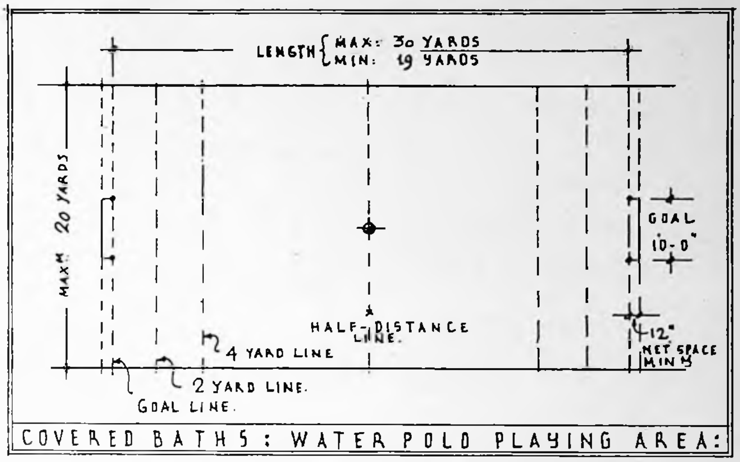


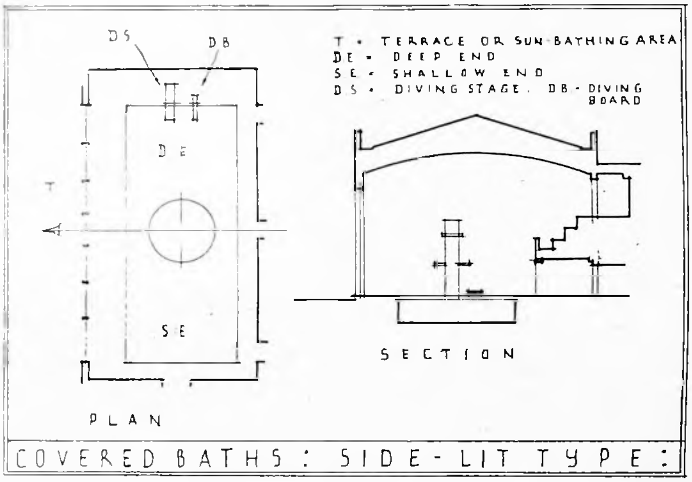
Figure 6

may sun-bathe or take part in physical exercises. Advantageous also is the amount of direct sunlight which penetrates the bath hall in a more efficient and pleasant manner than is possible with any form of roof lighting; in addition, the atmosphere and general appearance is more comfortable. The large glass area of a long wall naturally involves more heating in cold weather. There are several methods of treatment of the window wall, the best but most costly of which is to arrange the lower portion so that it may be lowered to below ground level, or, alternatively, lifted in sections on the principle of a sash window or by sliding sections sideways. Such a scheme allows the bath hall on occasions to be semi-open air: the alternative is to have a number of glazed doors formed in the window for access to the open air.



COVERED BATHS: WATER POLO PLAYING AREA:

Figure 7



COVERED BATHS: SIDE-LIT TYPE:

Figure 8

The majority of bath halls are top-lighted and ventilated from the roof with some side lighting from windows placed high in the walls in addition. Excessive height is to be avoided on the grounds of economy of construction, and a height equal to about half the shortest dimension of the hall is often found to be adequate.

Figure 8 illustrates a bath plan of the side-lighted type having one wall mainly of glass through which access to the garden is available. It should be noted that a wide bath surround is placed on the window side of the bath. It is important that foot-cleansing troughs should be planned between the terrace or lawns and the pool where bathers re-enter the building, and at the same time barriers or other means of control must be so arranged that bathers must pass through these foot-cleansing troughs to avoid carrying dirt into the water.

Spectators' Seating—Most baths provide some seating accommodation for spectators and in those which are to be used for competitions, water-polo matches and displays, ample seating is essential. The approach to this seating should be entirely separate from the bathers' circulations and the surrounds to the bath. The angle of vision for seated spectators is a most important consideration and a clear and unobstructed view of the whole water area should be provided. In schemes of lesser importance and in private baths which are used very occasionally for competitions special seating for spectators is not provided, but the bath surrounds are increased in width to about 7 ft which allows for two rows of temporary seats to be put in without cramping the bath surround unduly for bathers. Such a scheme of seating is to be avoided in baths frequently used for displays because of the dirt brought into the bath hall on spectators' shoes.

Galleries or seating are usually placed on the two long sides of the bath as these positions provide the best views for all types of water sports, but in some buildings—to increase seating capacity—further seats are provided at the end of the bath farthest from the diving boards (shallow end) and very occasionally at the diving board (deep) end. In the latter position high diving stages obstruct the view very badly. Smaller schemes and, in particular, private baths attached to schools and institutions are planned with seating on one long side of the bath hall only.

The usual methods of providing the spectators' seating are of two general types, namely, gallery or amphitheatre; the latter type is recommended by most authorities as it provides for better vision than by the use of galleries and at the same time spectators are closer to the water level. Figure 9 shows sections of both types. Amphitheatre seating is best arranged with the lowest tier about 4 ft 6 in above the bath surround, which prevents competitors and officials standing on the surround from obstructing vision excessively. The tiers in both types are better if gradated in increasing heights towards the top to assist the view from the back rows. Galleries often provide very bad sight-lines and vision of the nearest edge of the pool is often cut off, especially when galleries are not set back behind very wide surrounds to the pool. It should be noted that the amphitheatre type of seating is more costly mainly on the ground of the increase necessary in the span of the hall, but galleries increase the desirable height of the bath hall to a less extent. Figure 9 shows the approximate increase in span necessitated by the amphitheatre type of seating in two parallel examples. The gallery type is based on an allowance of 7 ft from the surround to the underside of the gallery for dressing-boxes. The dressing-boxes may be planned below the seating in the amphitheatre type as shown on the figure. The spacing of the seating in baths where there is admission to the public is governed by regulations controlling buildings for public entertainment as regards number and placing of exits, length of rows of seats, approach staircases and corridors, etc.

The seats are generally of teak supported on teak, metal or concrete supports from the structural steppings. All upholstery should be avoided. Guard rails and other barriers are

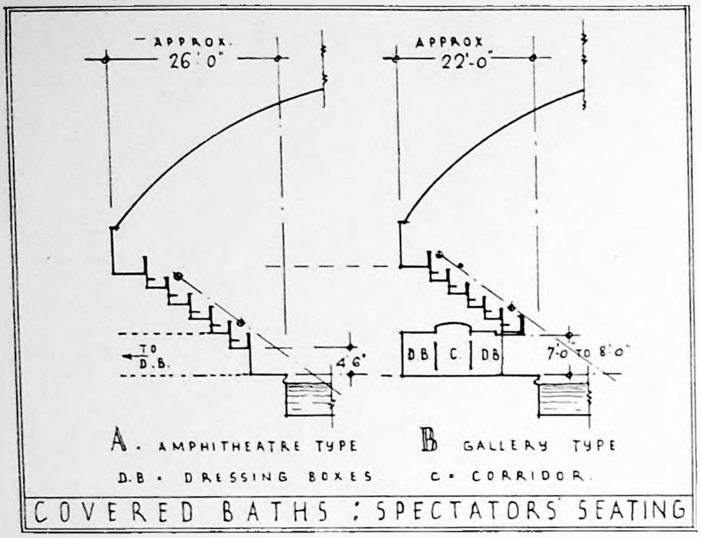


Figure 9

best of metal construction designed to avoid any undue obstruction of vision. The floors or steppings to the seats should be of an impervious material which can, if desired, be covered with matting or duck-boards. (See also section " Open-air Swimming Baths ")

Bath Hall Finishes—The actual construction and details of the pool itself are given in the section on " Open-air Swimming Baths," and generally these vary very little for covered baths. The bath hall itself should have a high dado of impervious materials such as tiles, glazed-brick or terrazzo, but this need not exceed 7 ft in height. The upper part of the walls may be of brick, concrete or similar structural materials either left natural, distempered or painted. The continual damp atmosphere should be remembered in conjunction with the selection of all materials.

Dressing Accommodation—Opinions seem to vary considerably concerning the amount of dressing accommodation necessary for a bath having given dimensions. The amount of dressing space in covered baths does not generally need to be so great as in open-air baths with sun-bathing terraces and other attractions which keep bathers on the premises for longer periods. Dressing-boxes are not as a rule provided for every bather in recent schemes. A box is used only at the actual time of changing clothes and the clothes are then deposited in a locker or stored under the control of attendants while the bather is in the water. The box can then be used for other bathers to dress or undress.

It has been suggested that one dressing-box should be provided for every 70 sq. ft of water area. This is a sufficient proportion if locker or other accommodation is provided at the rate of three or more places for each dressing-box.

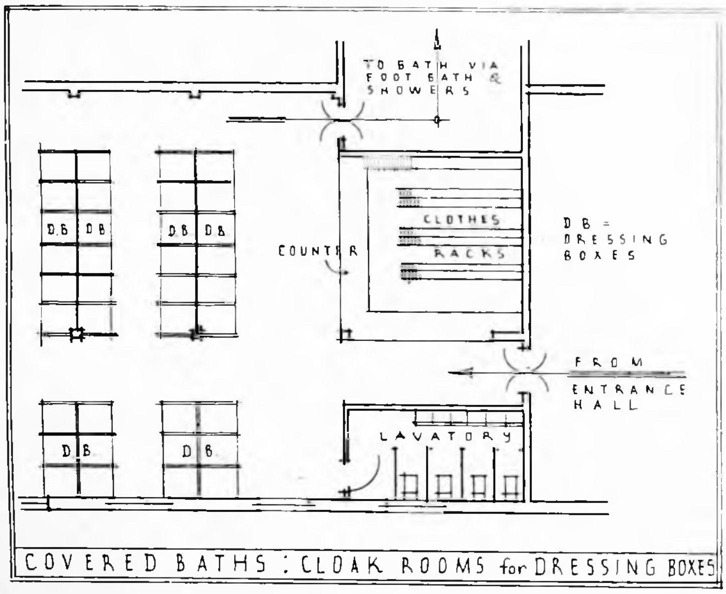


Figure 10

Dressing Rooms—Changing rooms for communal use are more economical than dressing-boxes as they save floor space and the cost of partitions, doors, etc. Many bath schemes provide communal dressing rooms for the use of children, members of clubs and for use at rush periods; at least one for each sex should be provided in all bath schemes. Dressing rooms and boxes should be planned to have good light and ample ventilation.

Dressing rooms should have fixed seats, preferably of teak, cantilevered from the walls rather than supported from the floor to facilitate cleaning. Locker seats are generally to be avoided in the interests of cleanliness. Coat and hat hooks should be provided above the seats spaced 12 in apart horizontally in a single row about 4 ft 6 in or 5 ft above the floor level. If island seats are introduced, these should be double-sided with a central partition of wire mesh to keep the clothes on each side apart. Gangways between seats should be at least 5 ft wide. The walls should be covered with impervious materials to a height of at least 5 ft and preferably 7 ft or more above the floor.

Dressing-boxes—Dressing-boxes should be either 2 ft 9 in wide by 3 ft 6 in long or 3 ft by 3 ft ; the former provides the more comfortable shape. Larger dimensions than given above are to be preferred, especially if it is possible to increase the length to about 5 ft and open the doors inwards instead of into the access corridors. Partitions are usually made of teak, terrazzo, metal or metal-faced plywood, and are generally 6 ft 6 in or 7 ft high above the floor and 6 in clear of the floor for cleaning. In some schemes where boxes are arranged in rooms devoted to each sex and not visible from the bath hall itself, partitions are sometimes reduced to 5 ft in height. Doors are sometimes the full height of the divisions, but often reduced in height to 4 ft 6 in and 6 in clear of the floor. A seat should be provided about 12 in wide and 18 in above the floor ; also a mirror, trinket shelves and at least two coat and hat hooks.

Storage of Clothes—Various methods of storage of bathers' clothes have been used including wooden or metal lockers, paper bags, wire baskets and combined baskets and hangers ; most of these methods are discussed in the section of " Open-air Swimming Baths." These systems depend on the presence of an attendant either walking about among the lockers or behind a counter to receive the clothes in exchange for a numbered disc which the bather carries during the time of swimming.

Diagrams of circulations in dressing-boxes and of clothes storage have

been given previously as stated above, but, in addition, Figure 10 shows a system based on wire baskets or combined baskets and hangers. The bather enters the dressing room from the main hall past the counter where an attendant hands out the basket and hanger, which is taken into any dressing-box available. The bather undresses, places the clothes in the basket and hands it to the attendant at the counter as he passes to the cleansing room which gives access to the bath hall. After bathing the process is reversed and the empty basket is handed to the attendant at the counter on leaving the dressing room for the main hall.

As stated in the paragraphs on general circulations, it is most important that the bath should be reached only by passing through the dressing room, and, if this access has to be provided from the entrance hall through the bath hall, barriers or other means must be provided to keep those who are dressed apart from those who are changed for bathing. This is in order to eliminate as far as possible dirt from boots and shoes being carried to the bath surround and also to enforce the use of bathers' cleansing rooms which are becoming a general provision. (See below.)

Lavatories—Lavatories must be provided in conjunction with dressing accommodation for the use of bathers. Separate accommodation is required for spectators, who should be provided for near their seating. The minimum provision should be two W.C.s and three urinals for men and two W.C.s for women, and the numbers generally should be based on one W.C. and one urinal for the first 60 men and one additional urinal for every additional 40 men and one W.C. for every 40 women. Care should be taken that the sanitary accommodation cannot ventilate into either the dressing rooms or bath hall. For convenience of plumbing services the sanitary accommodation is often placed adjoining the cleansing room at the approach to the bath hall. This position has the advantage of obviousness, but it is often difficult to ventilate when so placed without affecting the cleansing room and therefore a position as shown on Figure 10 is often preferred.

Cleansing Rooms—These rooms must be so placed that it is impossible to enter the bath without passing through them. Shower baths with warm water should be provided at the rate of at least one to every 50 bathers and preferably on a much more generous scale. Liquid soap containers are usually provided. Foot baths should be planned so that bathers must walk through them to enter the bath hall, and are best arranged as large shallow pools, 8 to 12 in deep, with constantly changing warm water. Figure 11 illustrates a typical layout of a cleansing room

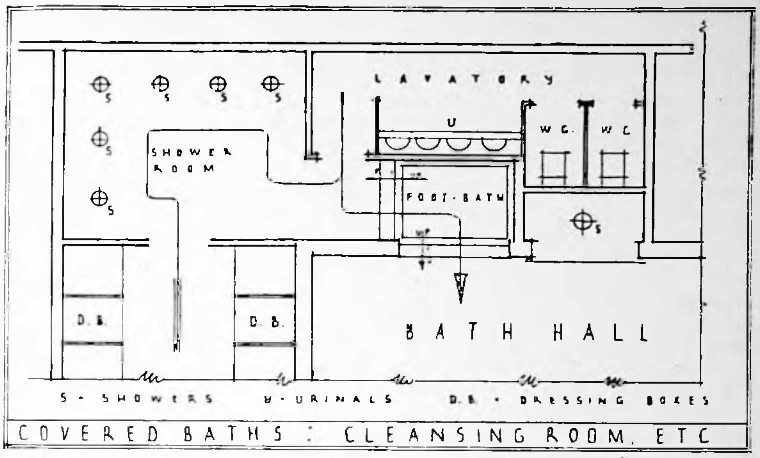


Figure 11

and shows in addition shower baths in the bath hall for use after swimming. These are generally desirable and are essential in sea-water baths. The return route of bathers from the bath to the dressing room may either be through the cleansing room or by doors or turnstiles operating in one direction only and leading immediately into the dressing rooms.

Swimming Bath Equipment—The usual equipment needed for swimming baths, such as diving boards, is given in considerable detail in the Section on "Open-air Baths." The usual apparatus provided comprises one and three metre spring boards and five metre firm boards; the spring boards need a water depth of at least 9 ft and preferably 10 ft, and the firm board a minimum of 10 ft and better 12 ft depth of water. If 10 metre high firm boards are installed the water depth should be 16 ft. Exact requirements for diving stages to be used for competitions are laid down by the International Amateur Swimming Federation and these are generally adopted for most bath schemes.

Filtration—A filtration plant is now considered essential in all schemes. There are very many systems, each of which needs different planning requirements and the spaces and areas necessary are mainly dependent on the quantity of water to be dealt with, consequently precise requirements cannot be set out in these articles. The general idea of the usual systems is summarised in the section on "Open-air Swimming Baths."

SLIPPER BATHS

The need of providing slipper baths has decreased considerably in recent years due to the general provision of baths in all new houses. Most authorities agree that division into first- and second-class baths is unnecessary and it has been suggested that economy may result by providing a minimum number of baths planned in such a way that the numbers for men and women can be varied from time to time.

Entrances—Most older schemes have separate entrances for slipper baths, and these are often sub-divided

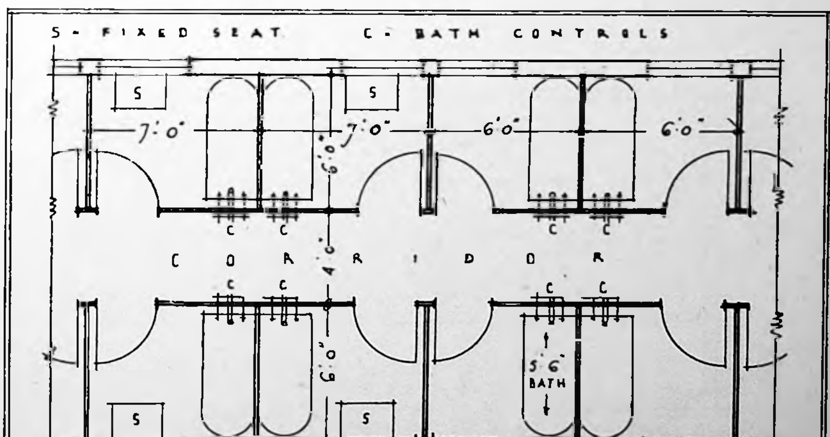


Figure 12

into two sexes and two classes, but it is better if the main entrance to the whole bath scheme can be used whenever possible, thus obviating the necessity of providing separate entrance halls and ticket offices, which involve additional staff for this control. If two classes are provided the same waiting room may be used, as there is in fact very little difference between the two classes of baths. The sexes, however, should be separated after leaving the ticket office and main entrance hall.

Waiting Rooms—A waiting room should be provided in association with each suite of baths ; the sizes of these rooms are dependent on the number of baths in the scheme. These rooms should be well lighted, preferably by windows rather than from top lights, and good ventilation is essential. The only essential equipment is seating, which is usually provided in the form of fixed continuous seating round the walls.

Bath Compartments—It is usual to plan the bath compartments on each side of a corridor. At one end of the corridor is placed the waiting room ; leading off the bath corridor, but preferably within the actual bath unit, should be placed some sanitary accommodation providing a minimum of two W.C.s for women or one W.C. and one urinal for men and a lavatory basin. The sanitary accommodation, if more than the minimum, should be one W.C. and one urinal for every 12 men and one W.C. for every 12 women. A small room is necessary for the attendant adjoining the corridor, placed as near the waiting room as possible, in order to control those entering the corridor, and from which he or she may issue towels and generally supervise the bath corridor. This room does not require a very large area, and 50 to 80 sq. ft. is generally sufficient, but a room is always preferable to a " box " or cupboard. The compartments are usually planned in pairs, to centralise the various services as much as possible. The compartments should be at least 6 ft 6 in by 6 ft, and preferably slightly more. Baths should be at least 5 ft 6 in. The divisions between the compartments should be of a hard material, such as terrazzo, tiles or glazed brick, and are usually 6 ft 9 in or 7 ft high above the floor. Wall linings should be of similar materials for the same height, with painted plaster above. Partitions, except behind fittings and doors, should be raised at least 3 in clear of the floor, to facilitate cleaning, and floors laid to fall to a channel so that the whole may be sprayed with a hose. The plumbing and services should be arranged so as to be controllable by the attendant from the corridor side of the corridor partitions.

Figure 12 illustrates part of a typical slipper bath plant, which is similar for either sex. Corridors should be at least 4 ft wide, and preferably a little more. Windows are desirable to each compartment as shown on Figure 12, but frequently the site does not permit of such a provision, and continuous roof lights have to be used, which are rather more difficult to control from the point of view of ventilation. The bath room in which the compartments are placed should not be less than 10 ft high in the clear to allow for good ventilation and rapid removal of steam. The equipment needed in bath compartments comprises some form of seating, which is usually a fixed hard wood seat, standing mats, mirror, towel rail and several coat and hat hooks.

Figure 13 illustrates a typical slipper bath unit. The approach from the main entrance hall leads into the waiting room, which has fixed seating round the walls. Adjoining the waiting room, but also having a door to the bath corridor, is the attendant's room. The lavatory is planned opposite the attendant's room, but, at the same time, it is adjoining the waiting room.

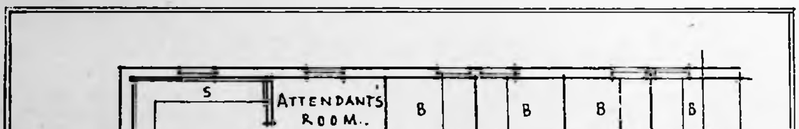


Figure 13

Shower Baths—It has been suggested by some authorities that shower baths might be provided instead of slipper baths, as they are more economical in space and in the quantity of hot water used. Generally, however, shower baths are not very popular and the public seem to prefer the normal tub type of bath.

In some schemes which do not have a unit for special types of baths, provision is made in the slipper baths section to provide for foam baths and occasionally for massage. Foam baths may be dealt with in compartments similar to those needed for slipper baths. Massage needs slightly larger cubicles for access on all sides of the massage pedestals and in conjunction with massage, rest couches must be provided, either in cubicles or in a separate waiting room.

Special Baths—Many public bath schemes provide certain types of special baths. In recent years, however, the demand for such equipment would appear to be less than in the past. The most usual of these provisions are Turkish, Russian, vapour and foam, and of these the first is that most frequently required. Vapour baths are very seldom needed. The equipment of all these types of baths is rather elaborate and costly, and unless there is a considerable demand they are uneconomical as an investment of public money.

Placing of Special Baths—In all schemes the special baths should, if possible, be approached from the main entrance of the whole bath establishment and should be served by the main ticket office, so that the control of the whole building is maintained at one central point. It is desirable that the special baths, since they need very large amounts of steam and hot water, are situated as near the main heating apparatus as the plan will allow. Daylight is not needed in the majority of the rooms and careful consideration has to be given to heat insulation of all the hotter rooms ; a position in the basement of the building is frequently adopted.

Turkish Baths—The usual lay-out and circulations needed in a Turkish bath are illustrated in Figure 14. The bather, having taken a ticket at the entrance hall ticket office, proceeds to the waiting room or lobby at the approach to the Turkish bath suite ; in this lobby he gives up the ticket to an attendant and usually removes his boots or shoes, which are placed in a boot- or cloakroom adjoining the attendant's room. Some accommodation must be provided either at this point or at the main ticket office for storage of personal valuables ; this provision should be in the form of small lockers. The attendant's room has to be equipped for the preparation of light refreshments, unless there is a kitchen or café in close proximity to the cooling room.

The bather enters the cooling room,

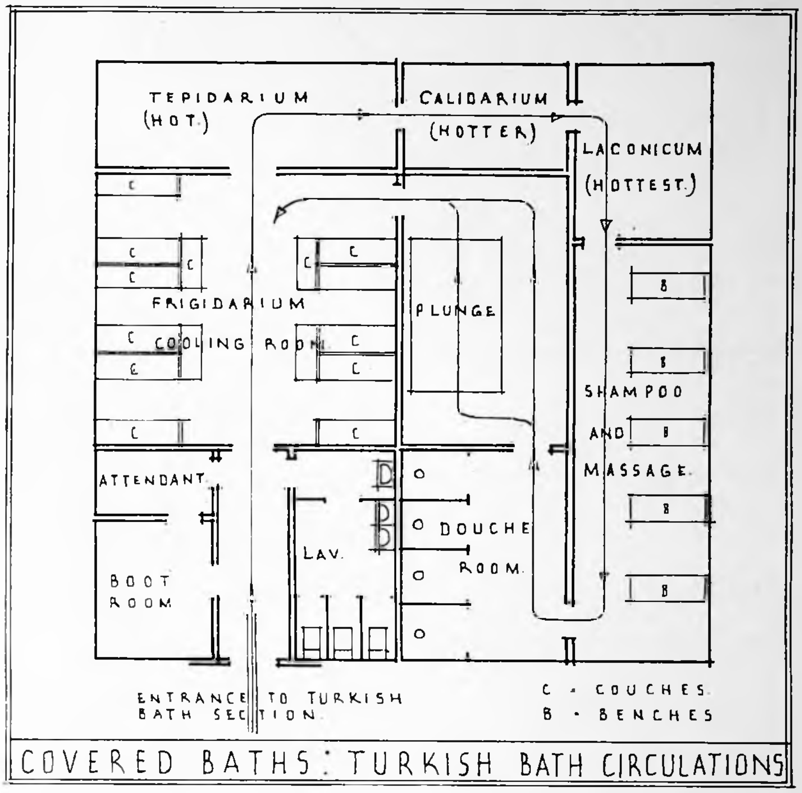


Figure 14

where he undresses and passes to the baths proper, which are usually three rooms of which the temperatures are gradually increasing. From the hottest room the bather passes to the shampoo room, where he may receive massage ; after which he enters a room containing douche, spray or shower baths and usually a small plunge bath. After the baths the bather returns to the cooling room and rests on a couch for a considerable time.

The boot-room is often used also as a cloakroom for clothes storage and, as such, must be controlled by the attendant. Some schemes provide a separate room or cubicles for dressing, apart from the cooling room, instead of allowing bathers to dress in the actual cooling room as is necessary in the type shown on Figure 14. Both of these rooms, when provided, should be well lighted, by daylight if the greatest efficiency is to be obtained. Very great care also has to be taken in the selection of materials both for construction and for finishings.

The shampooing room is fitted with a series of marble massage slabs on marble pedestals about 6 ft 6 in by 2 ft with a small lavatory basin placed near each pedestal. The floors and walls must be covered with impervious materials and the former laid to falls to remove the surplus water rapidly. The massage slabs are best if placed with one short end against the wall for circulation round the bather, but sometimes they are planned with a long side against the wall.

The baths following the massage are more usually of the shower type with a small plunge bath in addition ; this plunge bath does not need to be more than about 8 ft to 12 ft long, 6 ft wide, and 4 ft 6 in deep, with steps down at one end.

Dressing cubicles are usually formed of teak partitions 7 ft high above the floor and kept 6 in clear of the floor at the bottom for cleaning. A space about 4 ft by 4 ft is desirable in each cubicle. The equipment should comprise a fixed seat 12 in wide and 18 in high, mirror and clothes-pegs.

W.C.s and urinals should be provided at the rate of one W.C. and two urinals for every eight couches ; they should be easily accessible from the cooling room.

Russian Baths—These are very similar to Turkish baths and contain a boot-room, attendant's room, cooling room, hot room, steam vapour room, shampoo room, all similar to those described above except the steam room, which is equipped with a series of fixed seats in tiers. The general scheme of circulation is also similar to Turkish baths.

Russian baths are sometimes combined with Turkish baths, thus using the same shampooing room, shower and plunge baths, and cooling rooms.

• SWIMMING BATH

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Architects: Jackson & Greenan, F.R.I.B.A.

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23. *Open-air Swimming Baths*

Introduction—This section deals with the requirements of open-air swimming baths only, though much of the data is equally applicable to covered baths. There has been, in recent years, a very large increase in the demand for swimming accommodation; though many open-air baths for public and school use have been constructed, still more must be contemplated, since this type of bath can be provided reasonably cheaply and at the same time produce good revenue. Open-air baths attached to schools or private residences differ somewhat in requirements from the larger public baths intended to be used by large numbers.

Sites—There are few important factors governing the selection of a site for an open-air swimming bath, but among the points to be considered are ease of accessibility from all parts of the town which it serves, and also ample area to allow the proper provision of lawns, trees and car parks, when it is to be used as a separate unit.

In seaside towns the bath should be near the sea, as sea water is generally preferred by patrons; it should be placed in a prominent position readily accessible to the crowds and serve also as an attraction and entertainment. The two positions most frequently chosen are either the foreshore of the promenade (by enclosing an area of the beach or cliff-base) or adjoining the promenade on the inland side. There seems to be few particular advantages in favour of either scheme but, in the former, expensive construction may be needed to withstand the force of the sea, more especially in winter, while a drawback in the case of the latter position is the difficulty of obtaining a suitable site at an economic price.

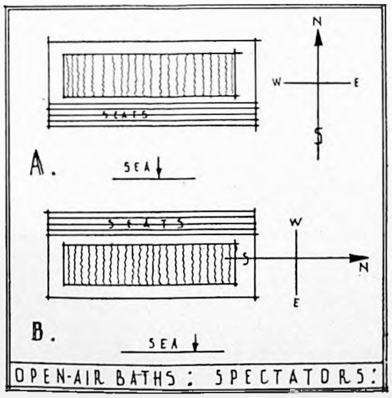


Figure 1

At inland towns the swimming bath sometimes forms part of a park or recreation centre and is, therefore, one unit of a large scheme which makes it easier to provide pleasant surroundings to the bath, and allows economies to be made, by the sharing car parks and cafês, since many patrons would use the bath in conjunction with other recreations.

Types of Public Bath—Open-air baths may be divided roughly into two types: first, those used purely for bathing, and, second, those used for bathing, but providing accommodation for spectators; in the former class a few spectators may occasionally be admitted for special events, but in the latter definite provision is made for the continual attendance of spectators; this type is usually required in large seaside baths. Where spectators are to be provided for, consideration must be given to aspect, for they must not be so seated as to face the sun while watching special events, which generally take place in the afternoon. Figure 1 shows the correct placing of spectators in relation to aspect, and it should be noticed that the position of the sea should not influence the placing of the spectators' stands. Three sides of the bath are frequently used for spectators; of these only two are likely to be satisfactory, as the north side has sun practically throughout the day and the east during the afternoon.

Children—Provision should be made for young children to bathe, but the normal bath is often too deep for them to use; two alternative methods of making suitable provision are, either to have a separate shallow bath near the ordinary bath or to have a very large area of water with a shallow part divided off. This scheme has been adopted in some seaside places in order that parents and children may use the same bath. This shallow area of the pool is also very useful for non-swimmers, who form a definite percentage of the users of public baths.

Relation of Lay-out to Sun—It is desirable that during the months that open-air baths are most used, the whole of the water area should be constantly in the full sun, and not partially shaded by dressing-boxes, spectators' stands or other buildings. Figure 2 illustrates the placing of the buildings in relation to the water area and the sun on an east to west lay-out.

Sun-bathing—Each year more swimming-bath patrons wish to sunbathe, and ample provision for this should be made by means of sufficient space round the water area and on the flat roofs of any surrounding buildings such as the dressing-boxes. These sun-bathing spaces should, however, be protected against wind as much as possible, and for this purpose trees will be found valuable, though they must not be of such height as to cast shadows over the lounging space, except in small areas; there should be some shaded space, however, for those patrons not wishing to lie in the direct sun, but the number of these appears to be small. Trees should not be placed so close to a bath as to allow leaves to fall into the water.

General Circulation—The general circulation in open-air baths is simple, but is of two types, the one is used when few spectators are catered for and the other when spectators constitute a large proportion of the total number of persons. Figure 3 illustrates the type in which spectators are not an important factor. In each example it is assumed that mixed bathing will generally be taking place, as the tendency appears to be to permit mixed bathing at all times when sufficient dressing accommodation is available. When mixed bathing is allowed the dressing accommodation for each sex must be properly separated and the circulation should be

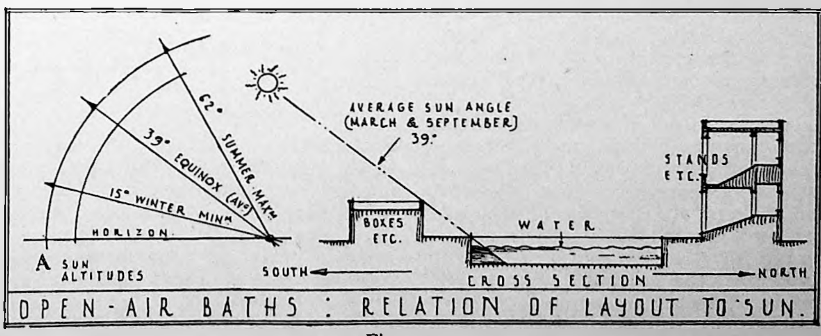


Figure 2

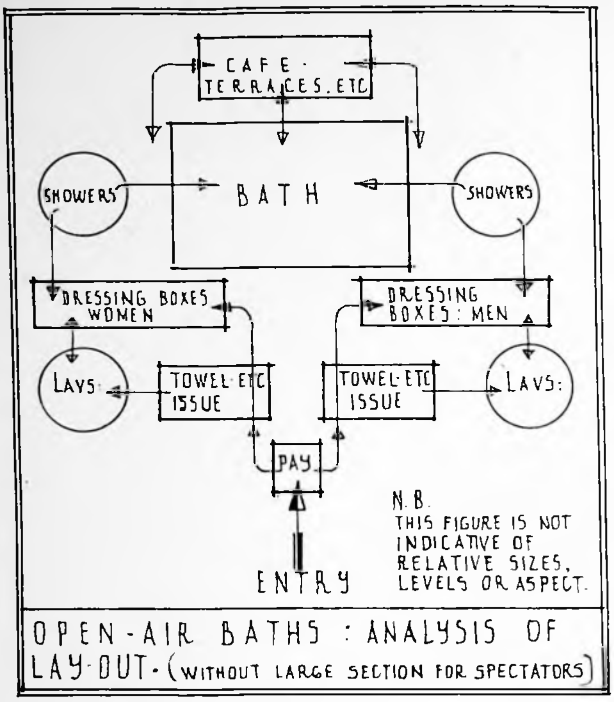


Figure 3

petitions or water polo matches are taking place, as the spectators cannot approach the performers or officials. If a café is provided, access must be equally easy from the bathing pool, the dressing-boxes and the spectators' galleries, but one part near the entrance should, if possible, be set aside for use by those with wet bathing dresses. In some seaside baths the spectators are accommodated at approximately promenade level over the dressing-boxes, and the pay-boxes are usually placed at the entrance level, thus allowing the bathers, who immediately proceed to the dressing-boxes at a lower level, to be separated easily from the spectators.

Bath—For general public use the minimum length should be 60 ft, but where championship events are to be held it is desirable that the bath should have a length of 165 ft (approx 50 metres) and a width of at least 60 ft; the Amateur Swimming Association does not permit races exceeding 500 yd to take place in baths less than 165 ft long. The width of baths for championship events should be 60 ft; this width is also the maximum

based on this principle. The entry should lead directly to the pay-box, after which the sexes separate, picking up, if they require them, towels and costumes, and passing to the dressing-boxes. The circulation to the dressing-boxes should not take patrons in their ordinary clothes and boots near to the bath, a matter which is discussed later. Lavatories for each sex should be attached to the dressing-boxes but should also be available to bathers without having to return through the dressing-boxes, especially when sun-bathing is permitted for long periods. Shower and foot-baths should be available between the bath and the dressing-rooms. It seems most satisfactory to place the dressing-rooms for one sex on one side of the bath and for the other sex on the other side, and the café, refreshment-rooms or similar common rooms together with staff rooms separating the two at one end and the entrance, with which may be grouped plant rooms, laundry, drying rooms, etc., at the other.

Figure 4 illustrates the main circulations required when spectators form a considerable proportion of the visitors to a bath. Most baths of this type are fairly large establishments and it is, therefore, wisest, to have one centrally-placed pay-box for both spectators and bathers so as to have all money under one control. This arrangement, however, usually means separating the issue of towels and bathing dresses from the pay-box, and tickets are issued at the pay-box and handed to an attendant in charge of the dressing-boxes, who gives out the bathing dresses and towels. Spectators should have very easy access to their seats without circulating in any part used by bathers.

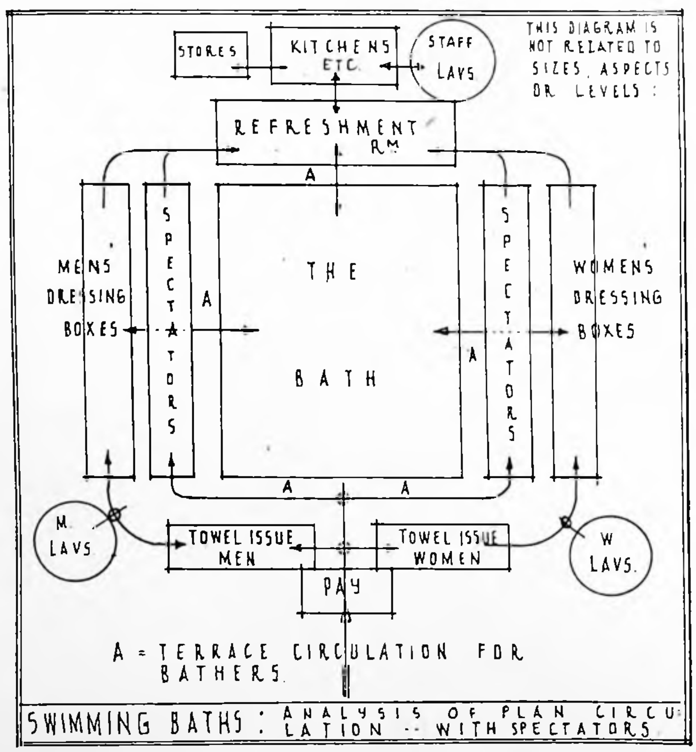


Figure 4

Bathers should pass from the entrance to their dressing-boxes without entering the parts of the bath used by those with bare feet to ensure that a minimum of mud and dirt is carried into the water. A usual arrangement for spectators is to seat them over the dressing-boxes, thus raising the lowest tier well above the level of the bath surround, a useful point when com-

permitted for water polo and therefore wooden booms, which are difficult to fix temporarily, are not needed if the bath is limited to these dimensions; for championship baths a depth of 6 or 7 ft is required over the whole of the water polo area, which is 30 yd long. For high diving a depth of at least 14 ft, preferably 15 ft, is necessary over the whole of an area extending

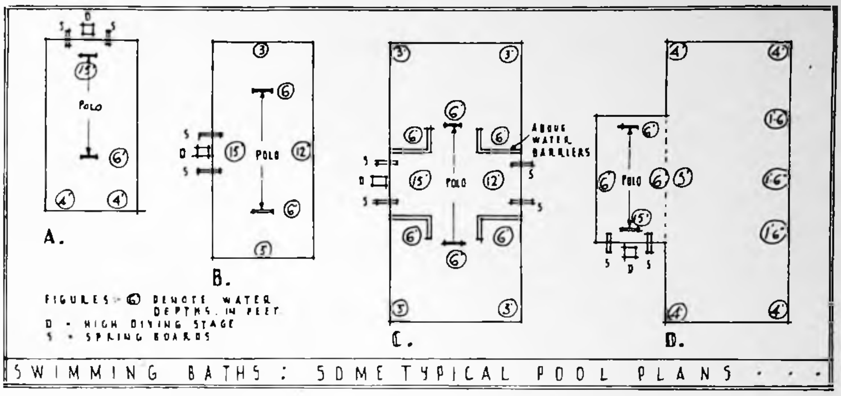


Figure 5

25 ft horizontally from a point immediately below the end of the highest board. Three feet is generally considered the minimum water depth, in which races can take place but in many public baths provision is now being made for very young children either in the same bath or in a separate one with a depth increasing from 1 ft 6 in. The maximum depth of a bath is largely dependent on the diving apparatus provided; the highest diving stage should not exceed twice the depth of the water. The edge of the bath or take-off should not be more than 18 in above the water level.

The deep portion of the bath is generally at one end, as shown in Figure 7, except in very large schemes where it is sometimes in the centre, as in Figure 6 which illustrates a typical section of this type, or sometimes special positions as shown in the plans illustrated in Figure 2. The dimension of 4 ft given on Figure 7 should be considered as the greatest permissible for shallow ends. The baths are sloped to the draining points which in smaller baths are often placed at one end, as suggested in Diagram A, but in larger ones it is usual to adopt schemes B or C in Figure 7 or that shown in Figure 6.

Shapes of Pools—The usual shape of pools is rectangular with the length about two or two and a half times the width when sections such as those in Figure 7 are used, but there is an increasing tendency in the larger schemes to use rectangular pools more square in shape with a section such as that shown on Figure 6. Figure 5 illustrates four different types of plan for swimming baths, Example A being the common rectangular type, with deep water at one end; Example B has deep water in the centre, and therefore the diving stages are placed at the centre of the long sides with the water polo space centrally. Examples C and D illustrate schemes adaptable for very large pools, particularly if water polo matches, diving exhibitions or racing events are to take place while the remainder of the water is being used for general bathing; each example has different merits but in each case non-swimmers may easily be separated from swimmers, particularly in Example D where all the deep water may be cut off by barriers from the rest of the bath. The placing of the deep water space to one side allows a very satisfactory lay-out for spectators' seats all in close proximity to the water, whereas in Example C the racing and polo space is more difficult to see. This scheme does, however, allow a greater length for racing than scheme D, in which the main part of the water area is too shallow for swimming events and is intended mainly for children and non-swimmers.

Capacity of A Pool—Water area allowance has to be made in accordance with the anticipated number of users, and figures are somewhat difficult to assess, but one American authority suggests an allowance of 36 sq. ft. per adult swimmer but, assuming one-third of the swimmers will not be in the water at any one time, an average of 27 sq. ft. should be provided for each swimmer at the time of the maximum use. In connection with assessment of space, the areas near the diving boards cannot, in fact, be much used for swimming as it is dangerous for more than two or three persons to be in the water at one time. Non-swimmers only require an area of about 10 sq. ft. per person.

Baths are also constructed in circular or elliptical forms and this is said to be very satisfactory for pools used by crowds or family parties, as there are varying water depths to suit all comers; it has been stated that only 25 per cent of the users of public baths, especially at seaside places, are swimmers. The advantages of a circular pool are that the shallow water all round the edge prevents non-swimmers falling into deep water and also, if the diving platform is placed in the centre, only swimmers are able to reach it. It is desirable, however, to have a rectangular pool at one side or adjoining for displays and racing.

Pool Construction—The majority of pools are constructed of reinforced concrete of varying thickness, depending on the surrounding site conditions. Reinforced concrete has the advantage of low first cost and may be in itself waterproof, although only a few inches in thickness. The finished lining surface is the important factor;

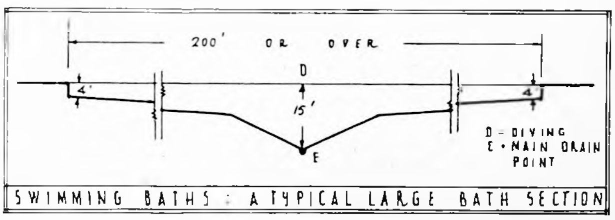


Figure 6

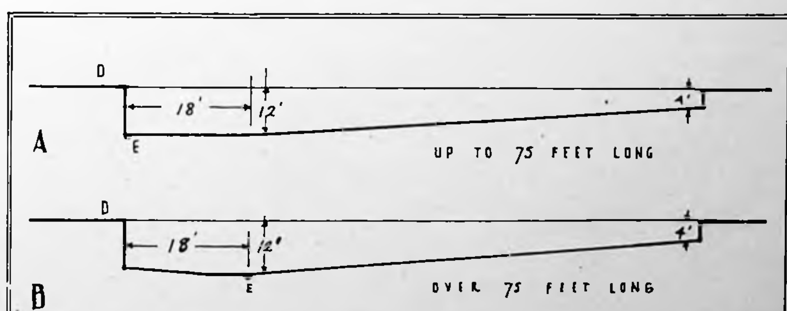


Figure 7

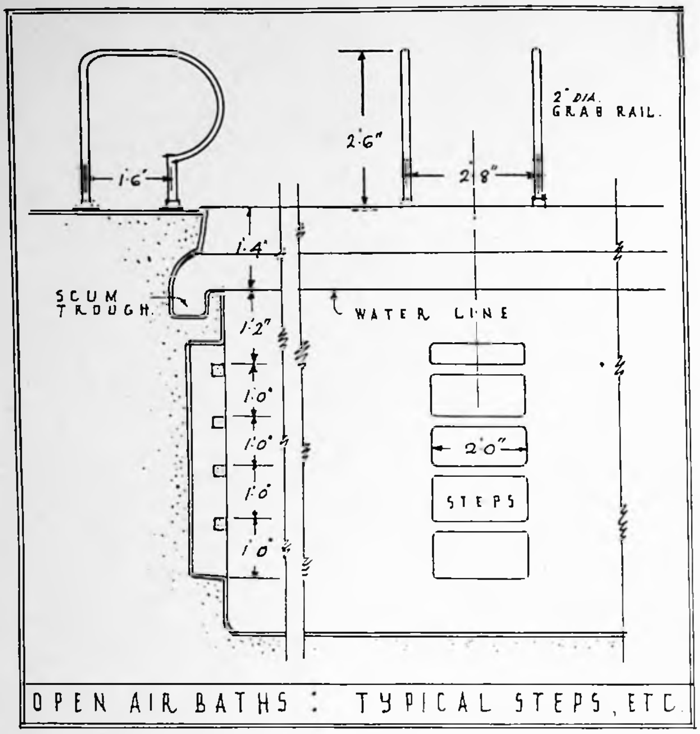


Figure 8

many finishes are available, but consideration has to be given to initial cost, upkeep, and cleanliness. The surface should be one which is smooth, so that dirt does not collect on it, and which does not crack ; joints should be reduced to a minimum, and the whole should be capable of easy washing down. Marble, glazed tiles, and terrazzo, which are often used for covered baths, are generally too costly for open-air baths and are liable to damage by frost, although open-air baths are generally emptied in the winter months. Ordinary cement-rendered surfaces are liable to crazing and are difficult to clean, but a polished rendered surface, or one made by pre-cast polished blocks backed with mass reinforced concrete can be cleaned very easily by washing only. The concrete surfaces may be finished with brushed or sprayed glazing materials, but the life of these materials is not yet known to be very long. A light-coloured material is desirable for pool linings.

Frequently a different coloured band of cement, tiles, or mosaic is placed at about the level of the water line or extending from a little below the water line to the top of the bath ; this band is used in order to protect the surface lining at the point at which scum may accumulate on the water, and consequently more and easier cleaning is needed. Its colour is often chosen so as to make the scum less noticeable.

Markings—The varying depths of water in the pool should be clearly marked in positions easily seen by those in the bath. It is general to mark only increases every foot in depth and the depth at each end.

Swimming lanes should be clearly marked on the bottom of the pool ; they must be at least 5 ft and are usually about 6 ft apart the outside line being placed 3 ft from the outer wall of the pool. The marking is generally carried out with dark colour bands in the same material as the lining of the pool or in tile or mosaic. It is usual to finish the lines at 4 or 5 ft from the ends (approximating one stroke) and to emphasise the end by a square mark or a continuous cross-band. The lane markings are generally 3 in wide, and it should be remembered that swimmers race over the lines and not between them. Distances should be marked in figures along the length of the bath.

Steps—Steps should be provided, but they should be either removable or recessed into the wall of the pool for special occasions. Steps are usually made of teak and even then are often covered with non-slip materials such as canvas or fibre matting. The permanent steps may be recessed into the walls of the pool, as shown in Figure 8 ; when they may be constructed of concrete, or non-slip tiles or wood as a part of the sides of the bath with recesses formed to receive the feet. Occasionally ordinary flights of steps are built in shallow places or recessed into the sides of the bath ; these are not, as a rule, very satisfactory and present difficulties in regard to non-slippery surfaces. Steps flush with the wall of the pool prevent injury to swimmers, which may happen where steps or ladders project into the water.

Handrails—Continuous handrails placed just above water level should always be installed unless the scum-trough is designed to incorporate a substitute for the rail. The rails are generally 2 in diameter galvanised metal barrel and require very strong fixing to the walls or decks, as they are used by bathers for getting out of the bath. Hand or grab rails should be provided at the top of each set of steps ; these rails are generally constructed in the same way as the bath handrail.

Scum Gutters—It is desirable to place scum gutters round all sides of the pool, so that any impurities which

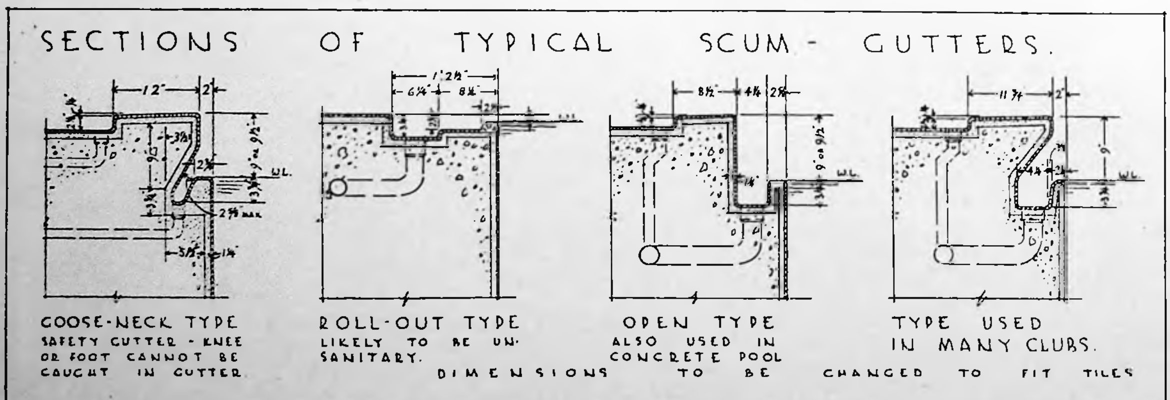


Figure 9

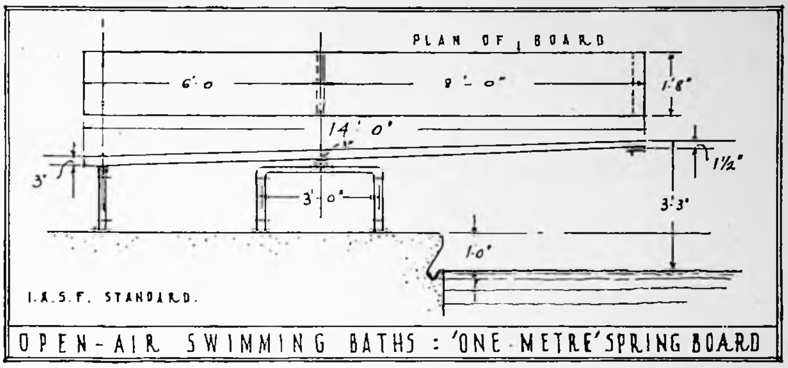


Figure 11

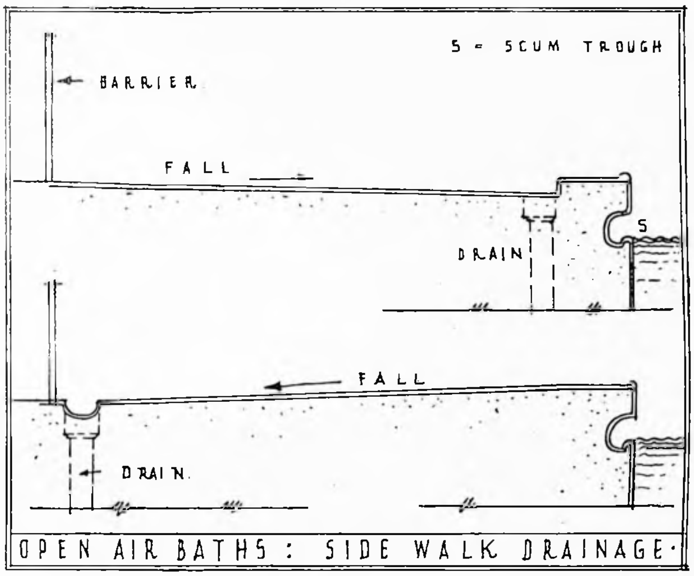


Figure 10

float on the surface may be drained away. In some cases the gutters are placed at one end of the bath only, but this has not proved satisfactory. There are two main types of scum gutter—open and recessed. Figure 9 illustrates four common sections, the outside examples of which are recessed and the inner two are open. The edges of all types should provide some form of hand grip. It is claimed that the open type is less dangerous to feet and legs and is cheaper to construct. The "roll out" type, although frequently adopted in cheaper construction, has the risk of being insanitary, more especially if the gutter itself is not deep and may therefore choke with dirt and water from the sidewalk round the pool. A further disadvantage of this type is the difficulty of standing at the edge of the bath with comfort. Of the recessed types the goose-neck section practically eliminates the risk of knees or feet being injured through becoming wedged in the recess; the gutters themselves should be deep to prevent water splashing back into the bath, and also the top edge should be slightly set back so that water from the platform level drips into the gutter. Good falls and drainage outlets at about 10 ft centres should be used for the rapid removal of water. In some baths a band of non-slip material is provided at each end just below the scum band as an aid to swimmers when turning.

Coping—The coping or edge of the pool should be non-slip tile, mosaic or other rough surface, since materials such as marble or terrazzo are extremely slippery when wet, and consequently dangerous.

Sidewalks— Sidewalks round the bath should be at least 4 ft wide at the sides and 10 ft at the ends; they must be sloped to fall to drains placed as shown in one of the two diagrams on Figure 10, in order to prevent dirt entering the pool. There is little preference in favour of either scheme, as each has its merits; the upper type is not too satisfactory, due to the placing of the gutter near the pool, but has the advantage of the drainage being placed nearest the source of the water, which should tend to keep the sidewalk drier. The scheme shown in the lower diagram has the gutter in a less dangerous place. It should be made impossible for visitors other than bathers changing for swimming to pass on to the sidewalks, and, if sun-bathing lawns and terraces are placed adjoining, barriers should be erected to force bathers to pass through a foot-bath before entering the pool itself. The main portion of the sidewalk other than the coping to the pool should be paved with a material which is impervious, easy to clean, and non-slippery. Natural stone, cement with non-slip surfaces, mosaic and ribbed tiles, have all been used with fair success in various open-air baths. The sidewalks should be of a light colour and of a different colour from walks used by non-bathers.

Diving-boards — Swimming baths are usually equipped with some type of diving-board. To ensure safety, the heights are fixed entirely by the depth of water, which should be a minimum of 7 ft. Generally speaking, the heights of stands or boards should not exceed twice the depth of the water, but a greater depth than 15 ft is seldom needed, as the usual maximum height is 32 ft 9½ in (10 metres) above water level. The greatest water depth should be 15 ft to 20 ft distant from the end of the diving-board. Boards are generally of two types, firm and spring; boards up to 10 ft above the water are generally made to spring, but are fixed for heights above 10 ft. For international events the following heights are usual:—Spring boards: 1 metre (3 ft 3½ in), 3 metres (9 ft 9½ in); firm boards: 5 metres (16 ft 4½ in), 10 metres (32 ft 9½ in).

Many baths, however, have boards both fixed and sprung at various other heights for practice and teaching. Divers prefer boards with a run-back of about 16 ft, and overhanging the water at least 6 ft beyond the edge of the bath. Boards which overhang near water level should be made movable for special racing or other important events. Care must be taken in placing boards so that the risk of one person diving on to another is minimised.

Spring Boards— There are two main types of spring board; firstly, the ordinary type which is made of pitchpine, or a flexible hardwood such as ash, well seasoned and oiled, 20 in wide and 3 in thick, covered with coco-nut matting and held down by metal clamps at both back and front points of support; secondly, the international types, some of which are of steel, but the majority are of Oregon pine. The 3-metre board is 16 ft long and the 1-metre is usually 14 ft long. Each is 20 in wide and 3 in thick from the back fixing to front support, beyond which it tapers to 1½ in. in thickness. The boards are held down only at the back and only rest on the intermediate support, which is placed about 8 ft 9 in. in the case of the 3-metre, and 8 ft in the case of the 1-metre board, from the diving end of the board. A rise of 6 in. in the board is general (see Figures 11 and 12).

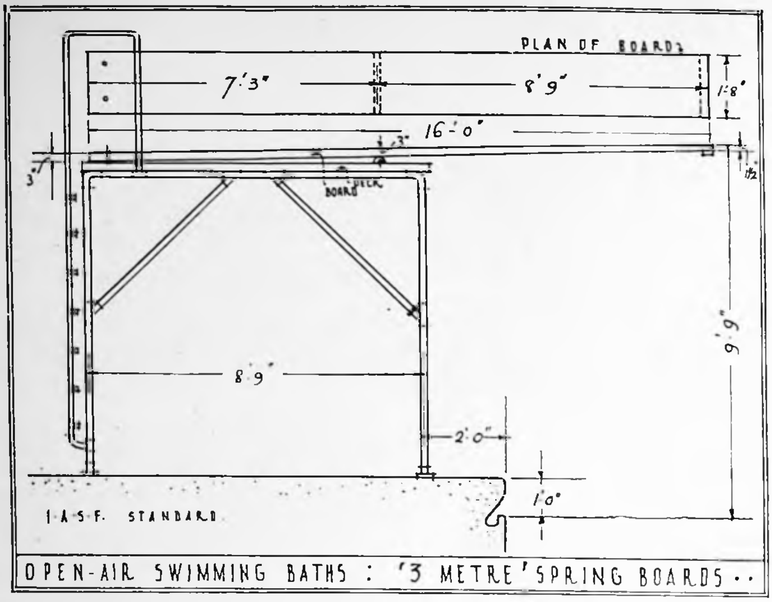


Figure 12

at the top of the chutes so as to avoid waiting on the approach ladder. The towers are made in various heights up to about 20 ft, with chutes 30 ft or more long. The chutes are sometimes designed to terminate near the side of the bath—a great advantage to users who are not expert swimmers.

Rafts—These are sometimes provided in very large pools and either have flat tops or are equipped with a raised portion for diving. Proper provision for gripping the raft should be made in the form of rope handles and a coco-nut matting cover should be used.

Other Equipment—Near the pool provision should be made for the following equipment. A clock, easily visible from all parts of the bath and its surrounding walks and sunbathing spaces: life-saving equipment—lifebuoys and poles with hooks; first-aid equipment and drinking fountains, the latter being essential in salt-water pools.

Firm Boards—These are generally made of teak, oak or mahogany, and are covered with coco-nut matting, which should be fixed so that there is no risk of injury to feet.

Diving Stages—Diving stages are placed in one of two different positions in large open-air baths; firstly, at one end or side, or in the water away from the edge of the pool. Platforms should have 16 ft clear run and should be about 4 ft 6 in. in width, although the International Federation requires 6 ft 6 in. The platforms should have railings on three sides, finishing at least 3 ft from the diving end of the board. A strip of coco-nut matting, about 20 in wide, should be fixed on the centre of each platform for the full length of the run. The diving stages may be constructed of timber, metal or reinforced concrete (see Figure 13), with steps to each level, preferably outside the spaces required for the runways. The platforms are usually placed at the following heights: 32 ft 9½ in (if water depth permits), 24 ft, 16 ft 4½ in and 12 ft with spring boards, adjoining or incorporated, of 3 metres and 1 metre (see Figure 14).

Frequently, diving stages are not made to provide the requirements of the International Amateur Swimming Association, particularly at schools and smaller pools. Full-length runs are not provided, nor full-width platforms, but types in which the platforms do not project adequately over the water should be avoided. Platforms, except at great expense, have to be placed over one another in many cases, but each stage should project 2 ft beyond the one below it. Diving-boards 18 in to 20 in wide are often fixed on to the platforms, but are not permitted for international events.

Water Chutes—These are very popular with bathers and should be installed in all public open-air baths. Types are now made which need not be used only in deep water. The chutes are generally constructed of metal supported on metal or wood framing, with wooden ladders. In large baths, ample platform space should be provided for persons waiting

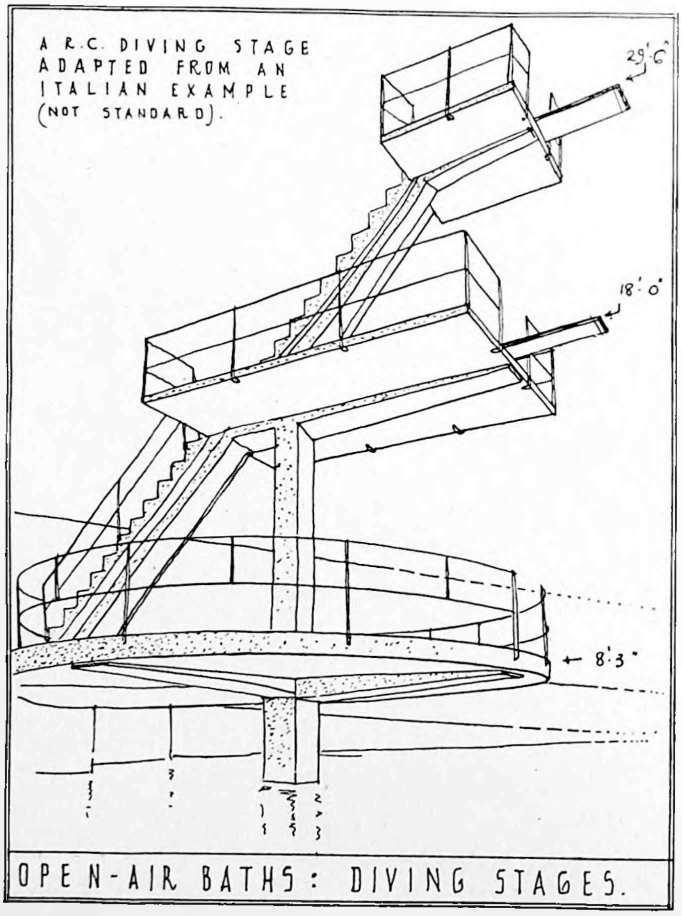


Figure 13

Dressing Accommodation— This accommodation may be provided in many ways, the selection of which is dependent mainly on the anticipated number of bathers and their class.

At schools, and for children attending large public baths, communal dressing-rooms are often provided, consisting only of a large room with a seat placed round the perimeter with hooks above it and isolated seats and cloak stands in the centre, if space allows. For cheapness this equipment is often carried out in deal coated with preservative, and with japanned metal fittings, while in those more expensively equipped teak is generally used, with bronze fittings. The seats, being used sometimes by children, should be fixed about 1 ft 3 in above the floor and need only be 12 in wide ; they should, if possible, be fixed clear of the floor, which has to be swilled with water for cleaning. The clothes hooks should be of the hat and coat type and should be placed about 12 in apart in single rows about 5 ft 6 in above the

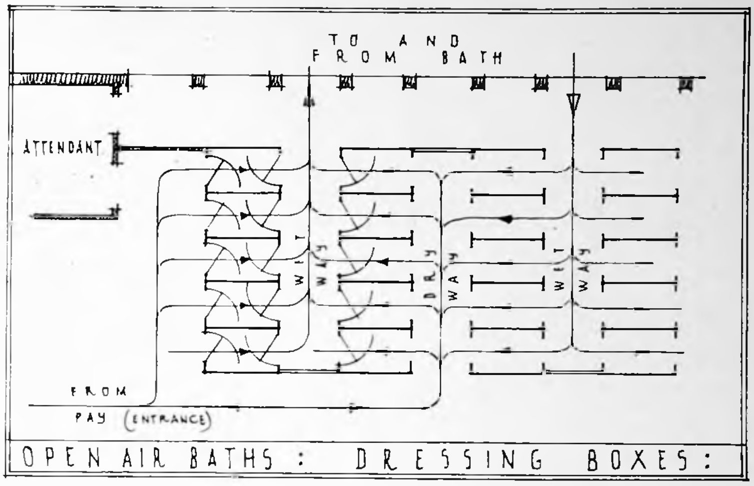


Figure 15

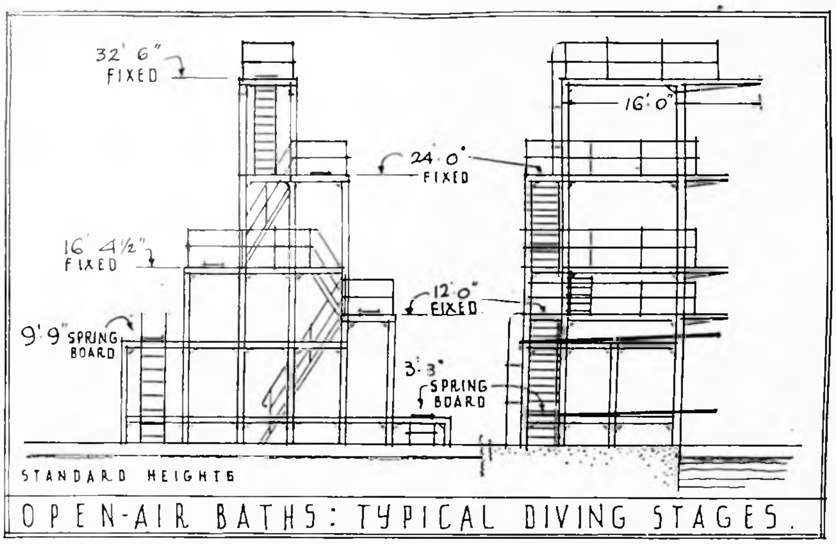


Figure 14

floor. This type of dressing-room is also provided for swimming clubs and similar groups of persons, when seats should be 18 in above the floor and hooks should be placed at 18-in centres. Provision should be made for leaving valuables, etc., with attendants.

Communal dressing-rooms or rooms fitted with dressing-boxes should be well lighted, and very well ventilated. Floors should be of impervious materials laid with slight falls to channels. It is essential that all dressing-boxes are covered as a protection against rain.

There are several lay-outs based on the dressing-box, the most common being the surrounding of the bath with separate boxes ; the alternatives are based on the grouping of boxes, either inside rooms or at least under cover.

Dressing-boxes should be at least 3 ft centre to centre, and 4 ft, but better 5 ft long, as in the former length doors must open outwards and are more liable to damage. Partitions are generally 6 ft 6 in high, although they are in some cases reduced to 5 ft only, and they should be kept 6 in clear of the floor for cleaning. Doors are sometimes the full height of the partitions, but more often only 4 ft 6 in high and 6 in clear of the floor. Partitions are most satisfactory if made of teak, but terrazzo and metal are also used in many examples. A cork or slat-constructed teak mat is desirable on the floor owing to wetness and the coldness of terrazzo and similar flooring materials. A seat is essential, preferably the full width of the box and about 12 in deep, placed 18 in above the floor, but it should be clear of the floor, and not of the locker type. Other equipment should consist of a small shelf, a mirror and at least one, preferably two, coat and hat hooks.

The boxes may be arranged on two principles. In small baths where only a limited number can bathe at one time each bather may have a separate box in which he undresses and leaves his clothes as in Figure 15 ; in the second method the bather undresses and hands his clothes to an attendant, leaving the box free for use by other bathers while he is in the water ; such an arrangement allows a reduction of boxes as one is sufficient for 15 to 20 bathers, and is therefore specially useful at seaside towns where some people stay on the premises half the day or more, and for large baths. The system as illustrated in Figure 16 works in the following way: On entering the bath the bather is given a paper or linen bag in which he places his clothes after undressing in the allotted dressing-box ; when undressed he signals to the locker room attendant who takes the bag containing the clothes through the small service door in the back of the box and receives a disc or key of the clothes locker in which the bag is placed ; this key he wears on his wrist or round his neck whilst bathing, during which time the dressing-box may be used by others ; on leaving the water he enters a vacant box, signals to the attendant who returns his clothes through the service door in exchange for the disc or key. The lockers may be 1 ft 3 in square on plan and 2 ft high if the bags are hung inside them. In some cases lockers are not used but hooks on which the bags are suspended. Paper bags, used once only, are preferable from the point of view of cleanliness. The disadvantage of the system shown in Figure 16 is that those wearing boots circulate upon the same floor as those with bare feet ; this should be avoided for reasons of cleanliness. Another type of locker system is that shown in Figure 17, where the lockers and dressing-boxes are placed in the same room ; each person is either given a key to a locker on entering the dressing-room or, after undressing, is allotted a locker ; in each method the key is carried while bathing. Locker numbers should be prominently displayed on the ends of tiers to avoid the employment of attendants for guidance ; it is also important to display notices giving full instructions on keys, lockers and dressing-boxes. General circulation marks or arrows inlaid in the floors might prove of material assistance.

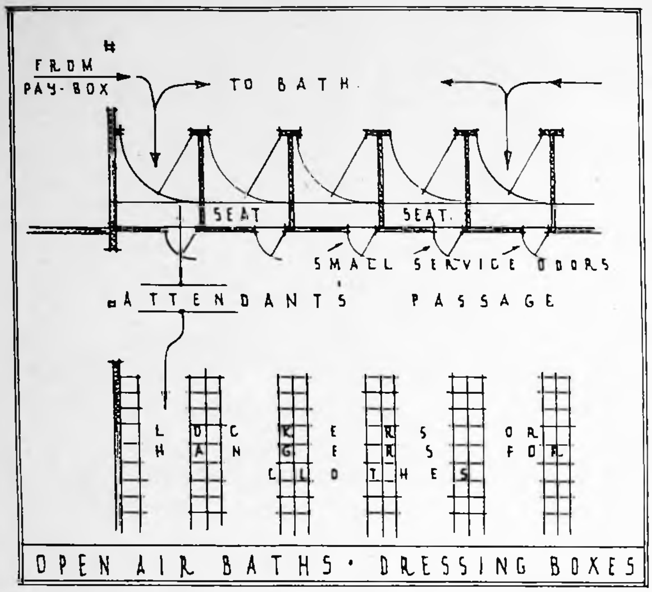


Figure 16

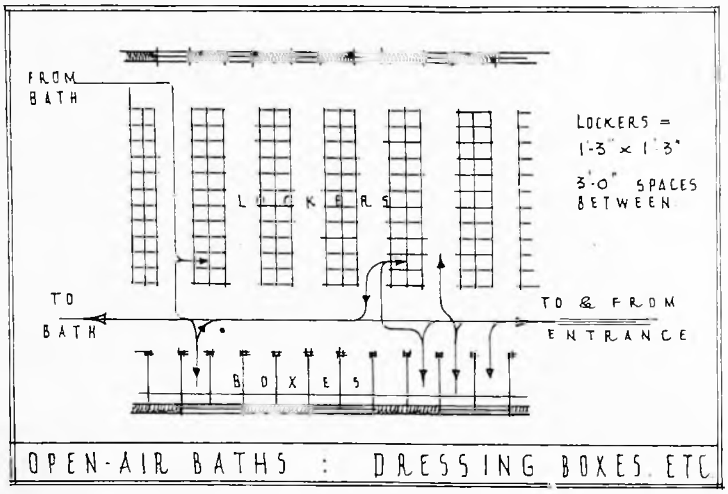


Figure 17

Figure 15 also illustrates a system to avoid circulation of those in boots over corridors used by barefooted bathers. The boxes have doors at each end and the circulation passes through them as shown. The bather enters a box on one side, locks the door, undresses, and leaves the box on the other side into a passage only leading to the bath. Similarly on his return he can only enter the dressing-boxes by the "wet-way," dress and leave the box on the other side on the "dry-way." By proper screening it is impossible for anyone to get into the wrong circulation.

Lavatories—Lavatories, W.C.s and urinals are mainly used by bathers, and, therefore, if circulations are divided into "wet" and "dry" they should be placed adjoining "wet" corridors.

Lavatory basins should be provided at the rate of 1 for every 60 bathers, calculated at the times when the bath is full, and W.C.s at the rate of 1 for every 40 females, and 1 for every 60 men with 1 urinal per 60 men in addition, calculated in the same manner.

Showers, etc—Shower-baths should be installed in a prominent position between the dressing-boxes and the bath at the rate of at least 1 per 40 bathers at peak periods. The position should be such that bathers are encouraged to use the showers before entering the bath. In some baths on the Continent, shower and foot baths are compulsory before bathing. Foot baths should also be encouraged and their use forced on bathers by making access to the bath only possible by passing through a foot bath of continuously running water. The latter is essential where bathers cross grass before entering the bathing pool.

Spectators' Accommodation—The placing of spectators' seating has already been discussed earlier in this section. They should have separate entrances in very large schemes or should be separated from the bathers after passing the pay-box at the entrance and in no circumstances should have access to the pool surround. Where spectators are to be admitted in large numbers proper seating accommodation is needed, separated from the bathers' accommodation by a barrier or low wall. Seating should be placed so that the users have their backs to the sun and on one long side only, if possible, leaving the opposite side free for officials during competitions and water polo matches. The flooring of circulation spaces should be coloured or paved with different materials to differentiate between circulations used by bathers and spectators. The lowest tier of seating should be raised well above the walking space surrounding the pool and seats must be raised so that each spectator has a proper view of the edge of the pool nearest to him, which is often achieved by placing raised tiers of seats over the bathers' dressing accommodation. It is preferable that some, if not the whole, of the spectators' accommodation should be covered, mainly as a protection against sun, which will be on spectators' backs, if the seating is properly orientated, but such cover is also desirable against sudden storms and showers. Entrances and exits to seats should be generously allowed to minimise disturbance and all gangways should be of ample width.

Figure 18 illustrates three common methods of providing seating accommodation for spectators; occasionally only tiers of concrete steps are provided without wood seats, and cushions, if required, may be hired at additional cost. Backs are seldom provided to seats except in a few semi-private baths attached to institutions such as clubs and universities. The omission of backs is due to the fact that spectators seldom use them if provided and the omission allows of lower first cost and reduced maintenance; seat spacing should be slightly increased if seat backs are introduced. It is stated that there is a greater risk of accidents to spectators who stand up and fall across the backs. The steps on which the seating is placed should have slight falls for drainage purposes and a gutter is, therefore, required at the lowest level either as shown in Diagram A in Figure 18 when a wall is used to separate the spectators, or a single gutter may be used to drain both the tiers of seats and the pool sidewalk if only barriers are used. Seats are, however, most satisfactory if made of teak or other hardwoods either fixed to metal frames or directly to the concrete steps; the seats may be constructed, if not too wide, in the solid, but more generally a slat type of construction is adopted and this has the advantage of drying more rapidly after rain.

Types A and B, Figure 18, both illustrate seats supported on metal

framework ; there is one great advantage of Type A in that persons seated in one row are not kicked by those behind them, as may so easily happen in Type B. Type C consists of seats fixed to battens embedded in the concrete steps ; when solid seats are used the battens are usually placed as shown on the figure and must have spaces at intervals for cross drainage, but with the slat type seat the battens are usually fixed from front to back in order that the front of the wood seat may overhang the face of the concrete riser.

Seating accommodation should be based on the assumption that each person requires 18 in run. Seats should be placed 14 in to 18 in above the level of each tier, the latter being more general as less knee space is required than with the lower seats ; seats over 18 in high are generally considered uncomfortable. As shown on Figure 18 a seat spacing of 2 ft 1 in back to back is sufficient except for front rows adjoining barriers or walls which should be increased to 2 ft 6 in. Seats are generally 10 in to 12 in wide, the former being usual. In Type B, where the seat is placed so near to the level of the feet of the spectators in the row behind, a space about 4 in wide between the edge of the step and the back of the wooden seat is desirable.

Spectators' Lavatories—Adequate provision of lavatories and W.C.s is needed for spectators separated from the bathers' accommodation, and therefore placed adjoining the circulations to and from the spectators' seats.

Night Lighting—Open-air baths are often used after darkness has fallen and provision must, therefore, be made for artificial lighting. One of the usual methods is to fix floodlights to tall posts round the sides of the pool ; these posts should be placed in such positions that they will not interrupt the walking ways surrounding the pool, where they might be dangerous, especially if near the edge of the water (Figure 19). The height and spacing of the posts is dependent on the size of the pool, but it is essential that the lighting area controlled by the lamp reflectors covers the entire water and that bathers walk or swim in evenly distributed light. Lighting is also required for the spectators' seats and it must be so placed that it will not interfere with good vision of the bath itself, and, therefore, lamps situated behind the spectators are most satisfactory. Steps used by spectators, if not otherwise well lighted, may be provided with internally lighted glass risers. Dressing-rooms and boxes also need artificial lighting for night use and on very dull days. Unless the partitions and doors of dressing-boxes are carried up to the ceiling individual lights are not needed and one lamp placed on the partition may be shared by two boxes ; the dressing-rooms are seldom sufficiently high to permit of the use of general lighting from centrally placed high-power lamps.

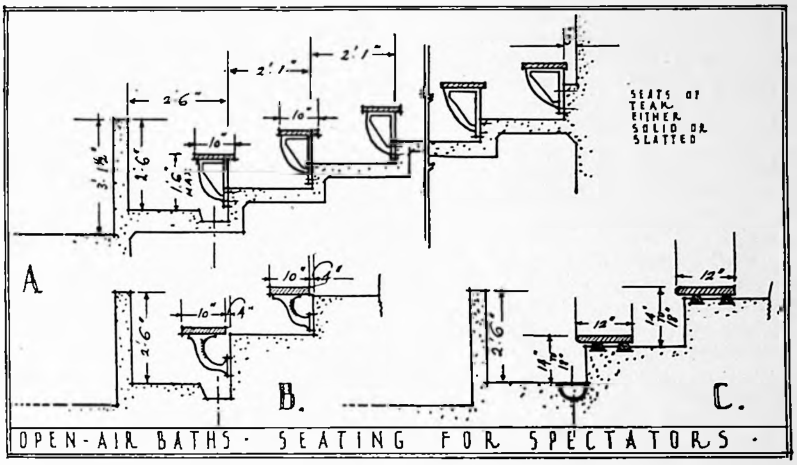


Figure 18

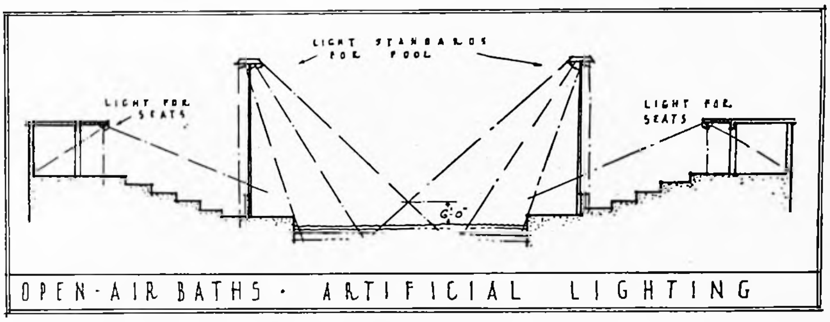


Figure 19

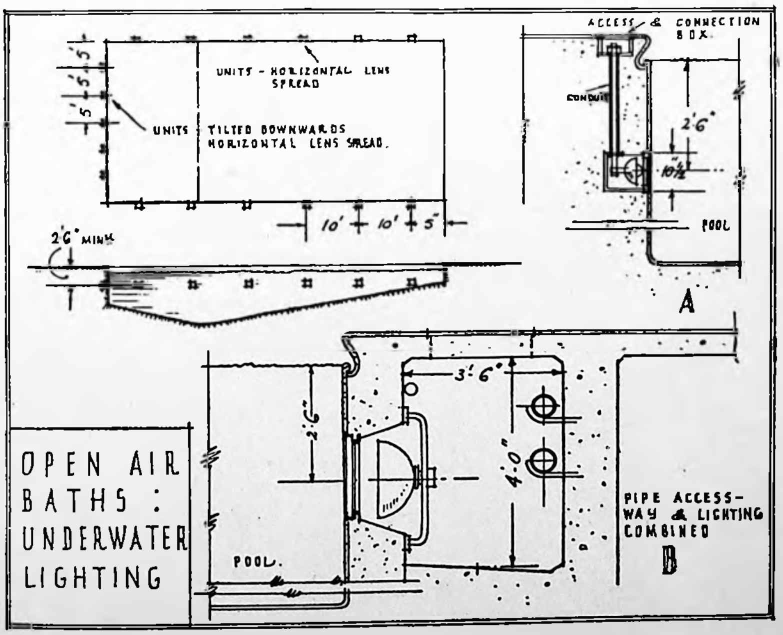


Figure 20

Under-water Lighting—Under-water lighting has not been very greatly used in this country, although there are a few baths so equipped, but elsewhere many experiments have been made with considerable success. Care should be taken to select suitably waterproof apparatus. The lighting units must be placed at least 2 ft 6 in below water level so that they are below the level at which swimmers push off from the bath side ; the greater part of the lighting is usually placed along the long sides of the bath with additional units at the deep end. The units are generally equipped with lenses or

reflectors constructed to spread the light evenly. Units are placed about 10 ft apart where large lights are wanted, as on the sides of the bath, and 5 ft apart at the deep end where less penetration but a great spread is needed, due to the extra depth (see Figure 20). There are various methods of installing the units, two of which are shown on Figure 20; Type A consists of recessed boxes containing the lamps which are let into the sides of the bath and Type B is by means of lamps placed in a pipe duct or walking-way shining through glass panels bedded in the walls of the pool. The latter method appears to be more expensive and mainly suitable for large schemes.

When underwater lighting is used, the intensity of overhead lighting on the water surface must be carefully arranged, or bad surface reflections may destroy the effect of the under-water lighting. A smooth and light-coloured pool lining surface is also very necessary to obtain full benefit from under-water illumination.

Treatment of Water—It is necessary either to have the water in the pool changed at short intervals, or to provide a filtering and sterilising plant through which the water is constantly circulated.

The old method of filling the bath, and using the water for a period of anything from one day to three weeks and then draining it away, is not only very liable to be unhealthy, but is also expensive, especially if the water has to be brought for each filling; the water also presents a very unattractive appearance to patrons. In some baths river water is circulated without treatment, whereas in others the river water is pumped out of the river, filtered and passed through the bath back to the river, in each case ensuring constantly changing water. Seaside baths are sometimes constructed with the outer walls below high tide level and thus the water changes twice each day; the objection to this system is that sand and seaweed enter the pool and the outer walls may also be dangerous to swimmers, as they are apt to become very slippery. Other seaside baths pump sea water into large settling tanks, which allow sand in suspension to drop; the water is then either used to make up the pool water level, and a proportion of the water which is constantly being returned to the sea, or as "make up" water on a normal circulation system. The period of time in which the whole water content of the bath should be passed through the filters is varied, mainly in proportion to the number of bathers; in most baths the period should be about four hours, but in large open-air schemes a rather longer period, such as seven or eight hours is general. Natural purification can only be relied upon when the pools are so large that full development of natural pond vegetation may take place and when they are fed by sufficient spring water to make up for evaporation. There are a few baths fed by natural springs, but as a rule the water is too cold for use without heating. The fill and empty system, when new water is only introduced occasionally at about weekly periods, is very unsatisfactory in every way, while daily filling, except in sea and riverside examples, may prove too heavy a tax on local water supplies. Where filtration plants are not provided, chemicals, such as chloride of lime and copper sulphate, may be added to the water, but although odours may be eliminated and appearance maintained, the water may still be bacteriologically unsatisfactory.

Continuous Filtration—The main point about a filtering plant is that it should be capable of dealing with overloads at rush periods, when a complete turnover of water may be necessary in 3½ hours or even less. All plant units which are liable to breakdown, or which have to be taken down for periodic cleaning or renewals, should, if possible, be in duplicate.

The circulation in a typical installation is as follows: From the deepest point water is drawn by a motor-driven pump, which is itself protected by a coarse strainer intended to remove such matter as leaves, hair, buttons from bathing costumes, and any solids which might be liable to damage the pump. A useful type is available with a quick-release cover, through which the wire basket strainer unit may be readily removed. After straining, coagulants such as sodium carbonate and sulphate of alumina are added in small quantities to the water by means of "dosing-pots": these coagulants produce an insoluble gelatinous precipitate (hydrate of alumina), which is retained as a film on the surface of the filter sand, sealing its interstices.

The filters themselves generally consist of at least two units, preferably more in large schemes, the filtering medium being sand, shingle, or crushed quartz. The filtration rate should not exceed about 200 gallons per square foot per hour and thus the filter size depends on the turnover rate and size of bath. Both gravity and pressure filters are available, but the water flow is slower through the gravity type, which therefore requires more space. The filters are cleaned by reversing the flow of water and carrying the resultant to sewers; at the same time the sand is turned over by a compressed air scour or by mechanical agitators. The interval between cleanings is variable, but a pressure gauge in the pipe line indicates the condition of the filter.

On leaving the filter, the water is neutral, but not resistant to fresh infections and it is therefore dosed with chlorine in a proportion of between 0·2 and 0·5 parts per million, either from a gas cylinder, or with any substance containing free chlorine. Sodium hypochlorite, for instance, may now be produced electrolytically and apparatus suitable for baths is now available.

Authorities differ as to whether aeration should take place before or after filtering, but it seems advisable, when aeration is done before filtering, to have some additional cascade or fountain to give the water extra sparkle.

The water is generally returned to the bath by several inlets at the shallow end, but occasionally there are additional inlets at the deep end, so as to move the water towards the outlet at the deepest point, generally some distance from the deep end of the pool.

For removing sediment from the bottom of the bath, or from settling tanks, several types of suction sweeper are available and these can be used without the necessity for emptying the bath.

It is essential that the outlets are large enough to prevent any dangers due to suction. Some designers let the water in at the deep end and overflow into the scum gutter at the shallow end in the belief that the dirtier water and floating matter from the crowded shallow end is carried off more rapidly. It is important that care is taken in chlorination to prevent over-dosing, as the result is irritating to the eyes and mucous membranes.

It is impossible to indicate sizes required for the plant rooms for filtration and recirculation, as individual manufacturers' needs vary considerably, as do the actual water contents of baths. The placing of the plant in relation to the pool

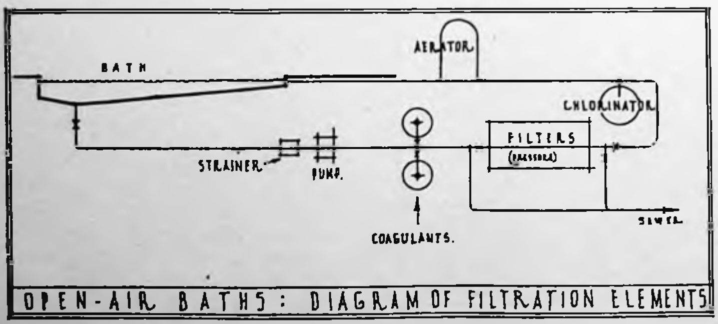
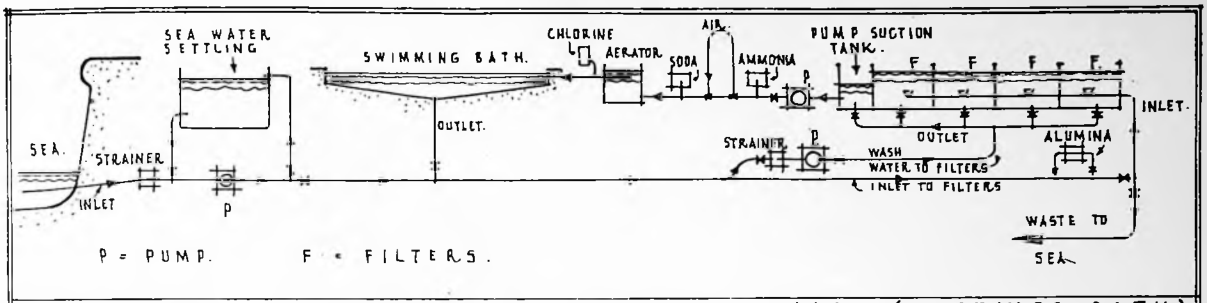


Figure 21



OPEN-AIR BATH : A SEA WATER CIRCULATING PLANT (HASTINGS BATH).

Figure 22

matters little and is usually dependent on the general lay-out of the other buildings attached to the scheme. Many open-air baths have their plant placed on approximately the same level as the bath surround, rather than sunk into the ground ; the placing is of little importance, as the pumps have to lift the water to bath level in any case. (See Figures 21 and 22.)

Warming of Water—In only a few open-air baths schemes is the expense of water heating considered to be economical, owing to the heat losses on cold days and during the night.

If a recirculation system is used, the water may be heated before being returned to the bath, but in other systems the problem is more difficult.

A boiler room is generally needed in all schemes for heating hot water for lavatories, showers, refreshment room and laundry. Heating may be by any of the usual methods, but as the load is very intermittent, automatically controlled gas or electric heating of boilers is specially worthy of consideration.

Waves—In some continental baths successful experiments have been made for the production of artificial waves and there are now several successful similar installations in this country. The waves are produced by mechanically agitating the water from one end of the bath, usually the deep end, by means of electric motors operating a form of propeller placed behind the end wall with long openings for the water to pass through the pool lining.

One drawback to the use of artificial waves is the greater loss of water into the scum gutters and the necessity for placing them higher above the normal water level. As an attraction, however, they appear to be very popular if operated at intervals, of say, fifteen minutes, with similar or longer smooth water periods for normal swimming.

Laundry—In many districts, laundry facilities are available for washing towels and bathing dresses at other institutions under the same control, but frequently, however, small laundries are attached to the bathing establishments themselves. One large room is generally sufficient to hold the required equipment, which consists only of a washing machine, a hydro-extractor (or a wringer in smaller establishments) and sometimes a small sized ironing machine. Drying in large schemes is sometimes by means of heated drying chambers, but very often ordinary open-air drying is adopted. Hot water in considerable quantities is needed for washing to be done satisfactorily, but one plant for all hot water purposes of the whole scheme is generally installed, unless localised gas or electric heating is found to be more economical in each section. It is often found a convenience if the laundry is placed close to the ticket office if the hiring and issue of towels, etc., also takes place there.

Staff Rooms—Staff changing rooms are needed for attendants of each sex with lavatories and W.C.s attached. In addition, mess rooms should be provided, a store for cleaning utensils and materials and an apparatus room, for storage of bath equipment. The latter must be large enough for storage of polo goals and diving-boards, which may be moved from their normal positions for special occasions.

Refreshments—In most of the large open-air bath schemes catering facilities are provided, while in small establishments a counter for the sale of tea, coffee, soft drinks and confectionery is usually needed. These catering facilities should be available both to bathers and spectators (if any), and special consideration should be paid to the provision of adequate facilities for those in wet costumes who would cause inconvenience if they were allowed to enter the refreshment room. Open terraces in the sunshine, where chairs and tables may be placed, should be provided.

Many cafés attached to baths do not provide a service of waiters or waitresses, but rely on " self-service " by patrons from counters or buffets ; but where large numbers use the café, service must be provided, and the planning will vary accordingly. Counters for the purchase of drinks and confectionery should in all cases be placed so that bathers with wet costumes may buy what they require without inconveniencing others using the restaurant ; especially is this the case where sunbathing terraces or lawns are provided. In large establishments two buffets and even two sections of the restaurant will be required to accommodate both spectators and bathers at the same time ; the latter are sometimes catered for by arranging serving hatches which may open on to a portion of the bathers' terrace or promenade so that they do not enter the café proper at all.

24. *Recreation*

Introduction—Types of open spaces may be divided roughly into two main categories, namely, public, or communal use, and private, for the use of owners only. Many of the provisions are similar in both types.

This section is confined to main essential information for laying out of public open spaces. These open spaces include parks, gardens, recreation spaces, children's playgrounds, open-air baths, all of which may be grouped together or provided separately. Any sufficiently large open space may be developed for one of these purposes and advantage should be taken of sites not suitable for building development, such as woodlands, low-lying ground at the sides of streams, etc. The children's playgrounds can with great advantage be placed near dwellings or in back land in the centres of groups of houses, thus avoiding the necessity of journeys and road crossings to reach the large public parks. The aim should be to provide children's playgrounds within half-a-mile of every house, but it should be borne in mind that playgrounds attached to schools are an assistance towards ideal disposition of open-air amenities. Some American cities have adopted a standard of one recreation space for every one square mile of the city, this space being a minimum of three to four acres in area. For the recreation centres provided for older children and adults the minimum size should be about 10 acres and preferably 20 acres, with some portion of the area laid out as a garden.

Care should be taken to grade and drain public spaces properly, so as to ensure reasonable dryness and rapid drying after rain. Grass makes the best surface for playgrounds when properly drained. Asphalt, concrete and gravel are generally agreed to be tiring and unattractive, and in addition, somewhat dangerous, although usually adopted for play spaces attached to schools. Drinking fountains should be provided in all public open spaces. Proper facilities are necessary for watering the grounds, especially hard tennis courts, running tracks, and gardens with lawns and flowers.

It is essential that wind-breaks should be provided round children's playgrounds and for some types of games such as tennis or badminton. These may be formed naturally by planting suitable hedges and trees, but the latter should be arranged, as far as possible, so as not to shut out the sun.

The following trees are very suitable for forming wind-screens :—

Lime
Poplar
Acacia
Beech
Douglas Fir

Of the above trees lime and beech are probably the most satisfactory, especially the former, which may be trained into any desired form.

The following shrubs are useful for providing dense backgrounds for play areas :—

Privet (Common Green)
Yew
Thuya Lobbii
Cupressus Lawsoniana
Tamarisk
Cupressus Macrocarpa

CHILDREN'S PLAY AREAS

General Notes— All apparatus should be placed apart from general recreation and game space, preferably in the shade. Dangerous apparatus should be avoided or used only under supervision. The apparatus must not only be beneficial to the children, but attractive. Swings and any other quickly moving apparatus are best placed at the sides or in the corners of the games space, to avoid children running into them when playing ball or other games.

Swings—Chair type swings are frequently provided for small children ; with this type there is less risk of small children falling backwards. To

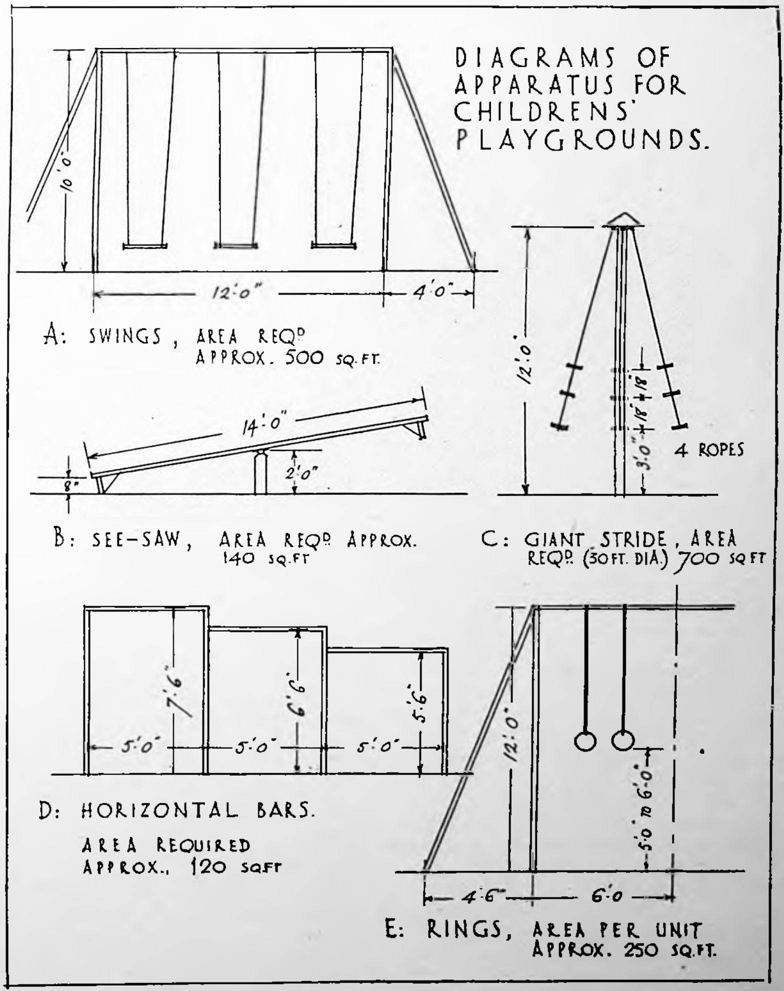


Figure 1

avoid the use of the chair swings by older children, they should be of small dimensions (twelve inches wide only). Chair swings should be spaced 18 in apart, and suspended 18 in above the ground from a cross-bar not exceeding 7 ft in height.

Swings for older children are usually arranged in sets of from three to eight, with uprights placed between every two or three swings.

A space of at least 4 ft is needed between each swing and a general height of 10 or 12 ft to the cross-bar should be allowed as illustrated in Figure 1, Diagram A. The frames may be constructed either of wood, concrete, or galvanised iron tubing, the latter being the most satisfactory. Chains should be used to support the seats, which should have rubber buffers on the edges to prevent serious injury to the children. A good precaution is to mark the possible swinging area with white lines on the ground, outside which onlookers should be made to stand.

See-saw—This apparatus is generally used for smaller children. The longer and lower it is, the safer it becomes. It is usual to provide a plank 12 to 14 ft long, 10 in wide, and 2 in thick, with all ends and edges carefully rounded. The standard on which the plank swings and is fixed is generally 24 in high. On the underside of the ends of the plank should be fixed wooden, rubber-covered bumpers 8 in high, as illustrated in Figure 1, Diagram B.

Giant Stride—Diagram C in Figure 1 shows this apparatus, which consists of an upright galvanised steel tube 12 to 18 ft above the ground, with a pivoted head, to which are attached several ropes (usually four or eight). Knots must be made in the rope or wooden handles provided at intervals of about 18 in to prevent hands sliding down the ropes.

Horizontal Bar—A good type of horizontal bar is shown in Figure 1, Diagram D, which provides for the needs of children of various heights. The apparatus may be constructed of metal tubing, with the cross bar of painted metal or, better, wood. A width of five feet per bar and heights varying from 5 ft to 7 ft 6 in should be allowed.

Rings—This apparatus, as shown in Diagram E, is similar to the swing, but provides facilities for arm exercises. Rings should be at various heights, but 5 to 6 ft is a good average.

Other Apparatus—Much other apparatus may be provided. Parallel bars, climbing ladders, and ropes are specially useful for gymnastic purposes, but these usually need proper supervision and organised use. On the Continent provision is sometimes made for various entertainment apparatus, such as merry-go-rounds, slides, miniature motor racing tracks, etc., for which charges are made. Slightly raised platforms of wood are sometimes provided for the smaller children to use for "floor games," and these stages are sometimes covered with a permanent roof on posts, or with adjustable canvas sun blinds.

Children's Boating Pools—These pools are a great attraction to children, whether set in a children's playground or in a general park, and can usually be operated to show a reasonable profit. The pools may be any shape and size, but with water not exceeding 18 in to 2 ft in depth. Irregular shapes are generally to be preferred. The boats used are either miniature canoes, rowing-boats, hand-propelled paddle boats, or electric motor-boats. Natural pools may be used, but specially constructed concrete ones are better; in both cases wide concrete or stone surrounds are needed. Provision should be made for chaining up boats when not in use, either to the surround, in which case it should be lined with timber battening, to prevent damage to the boats, or, better, to an island set in the centre in the water, thus placing the boats out of reach except to attendants equipped with waders.

Paddling Pool—A paddling pool is a great attraction to children, both for its named purpose and for the sailing of model boats. The depth should vary from a few inches to about 15 in. A good average size is 50 ft in diameter or its equivalent. An irregular shape is probably most attractive, although a rectangular one is undoubtedly less expensive to construct. A concrete walk should be arranged round the pool, and should be sloped away from it to prevent the return of soiled water to the pool. Seats for adults should be placed overlooking the pool. The best material for the construction of the pool is concrete, but it should not be finished very white in colour, as the reflections on sunny days are trying to children's eyes. Water should be kept running continuously to remove dirt and scum. This is frequently provided by means of an inlet through a fountain. Ample space in the form of a lawn should adjoin the pool. It is sometimes possible to form a shallow pool or

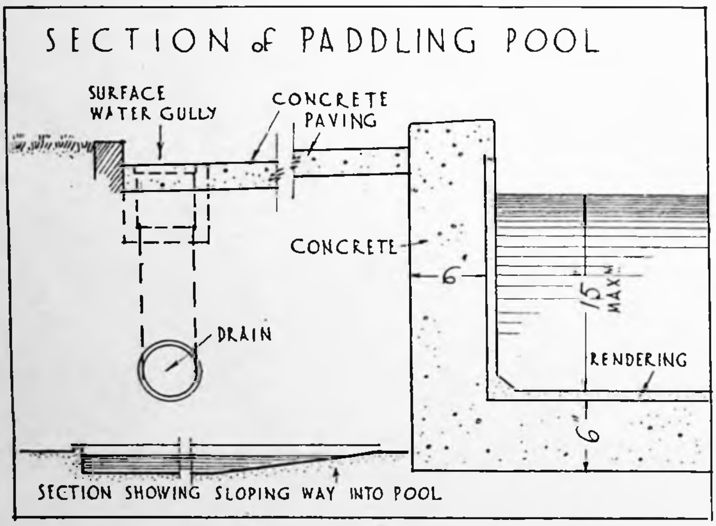


Figure 2

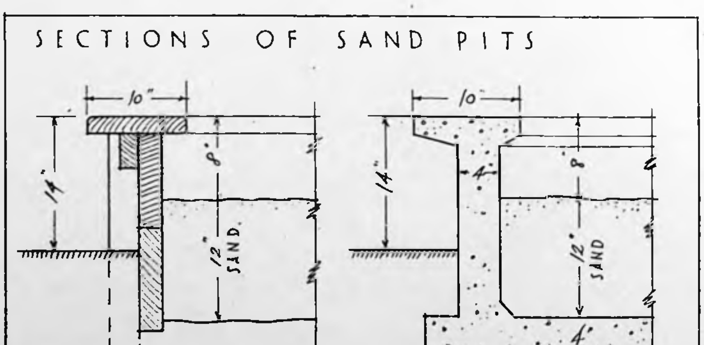


Figure 3

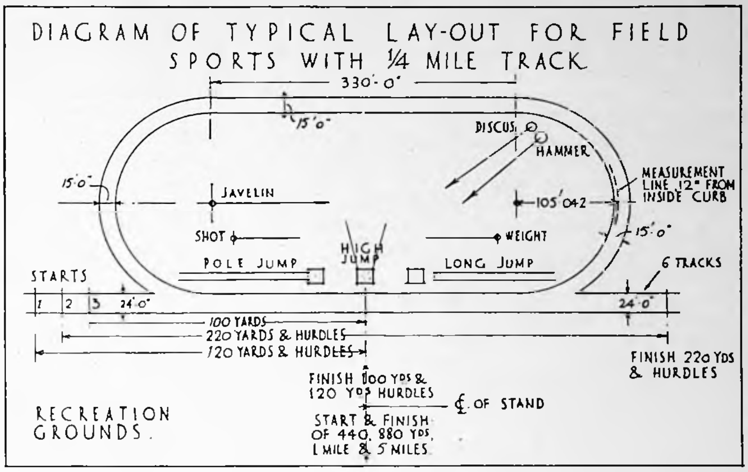


Figure 4

trough through which the children walk before entering the pool, thus preventing dirt from being taken into the water on the children's feet. Figure 2 shows a good type of section to a concrete pool. The small section shows a suggested sloping bottom to the pool at one end, so that the small children may enter easily and without risk of falling into the deeper water.

Sand Pits—Sand pits are better if constructed with wood or concrete surrounds rather than the sand being placed in holes in the ground. A properly constructed box facilitates the changing of the sand. The best sizes vary between 6 ft by 10 ft to 12 ft by 20 ft. A shelf 10 or 12 in wide should be fixed round the box to act as a seat and a modelling shelf, and also by its extension over the sand area will keep the sand from being spread over the surrounding space. Covers are desirable for protection at night, and may be provided either in the form of removable boarding placed on the seats or a permanent shelter. The latter permits the use of the sand pit in bad weather, but keeps the sun off the children when playing. Seats for adults overlooking the sand pit are desirable. The criticism that sand pits harbour vermin may be overcome by sprinkling the sand with a safe type of modern insecticide. Sand should be raked over every day, and be changed frequently, preferably monthly. Figure 3 shows two suggested sections for sand pits. Diagram A shows wooden construction with a rammed earth bottom, and Diagram B shows concrete construction in tank form. If a tank form is used, care must be taken to provide for drainage of surface water from the bottom of the tank. All edges and arrises should be rounded to avoid all risk of personal damage.

ADULT PLAY AREAS

Larger spaces are naturally required for older children and adults than for younger children, and they may be situated farther away from the homes of the users, but the maximum distance should not exceed one mile. Concentration should be on games which provide recreation for the greatest numbers in the smallest area. Large level spaces are required for many of the adult games such as cricket and football, and great care is therefore necessary in the selection of a site to reduce the cost of levelling. Many games are played separately by each sex, but in the case of tennis and hockey the land is jointly used, a circumstance that is also usual for open-air swimming pools. Pavilions either for refreshments, changing, or both, should be situated as centrally as possible and provide proper sanitary conveniences. The minimum area on which athletic fields can be arranged is about five acres, and ten acres or more is more economical and satisfactory, as such an area allows the grouping of many and various athletic activities at one centre. Some difficulties are experienced by the fact that it is impossible to use the same ground area for several games even at different seasons of the year.

Athletic Ground—This ground should provide a running track and, in addition, spaces for such exercises as jumping, throwing the javelin, etc. It is usual to lay out the running track round the outside of the ground, with spaces for other sports arranged within the shape of the track. The best length for the track is once round for a quarter of a mile, which is generally measured twelve inches from the surrounding curb. If possible a 220-yd section of straight track should be provided. The track should be 24 ft wide, thus providing six widths for sprints and five for hurdles. A good track construction is, firstly a 6-in layer of coarse rubble or clinkers, secondly a 3-in layer of smaller clinkers, and, thirdly, a 4-in top-dressing of finely screened clinker mixed with clay or loam to act as a binder. A curb of wood or concrete should be provided on the inside edge of the track. Figure 4 shows an athletic ground laid out on the basis of a quarter-mile track with easy curves at the ends; but if games such as football are to be played, a larger circumference may be needed.

It will be noticed that, as far as possible, all events finish in front of or towards the spectators' stand, which is situated at the centre of one of the long sides, preferably on the south or west sides so that spectators do not face towards the sun.

The following details are given in connection with the particular requirements of such team games as are generally provided in public recreation centres in towns and cities :—

Cricket—The wicket is 22 yd long, and allowance in width should be made for several pitches side by side. The boundaries are to a great extent arbitrary, but a circle of at least 450 ft in diameter should be allowed. It is quite general to place the actual pitches between football or hockey grounds, to avoid damage during the winter months. Twenty-two persons only play at one time, which is very few compared to the area occupied.

Association Football—The playing area may vary from 300 to 390 ft long by 150 to 300 ft wide. The standard international pitch is 360 ft long by 240 ft wide. At least 10 ft should be allowed round the playing space. (Figure 5, Diagram A.)

Rugby Football—The actual playing area is 330 ft long by 225 ft wide, with the addition of a space not exceeding 75 ft at each end for the touch-down space. At least 10 ft should be allowed at the sides of the pitch. (Figure 5, Diagram B.)

Hockey—The pitch is 300 ft long by 165 to 180 ft wide, round which at least 10 ft should be allowed. (Figure 5, Diagram C.)

Basket Ball or Net Ball—The goals consist of posts supporting baskets 18 in. in diameter, 10 ft above ground level. The full-size match court is 100 ft long by 50 ft wide, divided as shown in Figure 5, Diagram D. At least 10 ft should be allowed round the playing space. A small court is often used for practice games which measure 70 ft by 50 ft and is marked out in a slightly different manner.

Tennis—Various surfaces such as grass, asphalt, or patent hard materials are suitable. Figure 6, Diagram A, shows the standard marking of a court, which is 78 ft long by 36 ft wide, to which must be added as run-back at least 21 ft at each end and 12 ft at the sides. The surrounding spaces are often reduced except for special match courts. Where several courts are placed together in public recreation grounds it is general to allow 120 ft in length, with 6 to 10 ft between courts. Courts need orientation to avoid the sun shining in players' eyes; north-east to south-west for the main axis is the best

aspect for general purposes. Courts should be enclosed with galvanised wire fencing 10 to 12 ft high. Good drainage is essential.

Badminton—Figure 6, Diagram B, shows the standard sizes of badminton courts, which are 44 ft long and 20 ft wide for doubles games, and singles courts 17 ft wide, as shown by the inner lines of the diagram. The game may be played either indoors or in the open-air. Outside courts should be sheltered very carefully from the wind, owing to the light weight of the shuttlecock. Floors of courts may be wood, asphalt, cement, or of a patent polished non-sweating material.

Covered badminton courts require an internal size of at least 64 ft long and 32 ft wide and 25 ft high at the centre, which can be slightly diminished towards the ends and sides of the court. As the walls are not used as playing surfaces, they may be of any suitable material, but floors are generally of wood, such as maple, and should be in narrow widths secretly nailed.

Top-light is essential, preferably the full width of the court and about one-third of the area of the court and artificial light is of great importance as courts are often used in the evening.

Squash Rackets—This is an indoor game, but courts may be grouped with other adult recreation facilities in parks or playgrounds for the convenience of the users and to assist in controlling sales of tickets and booking of courts, more especially if a public

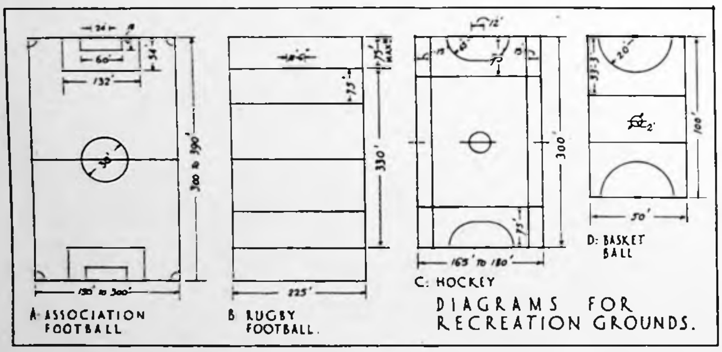


Figure 5

swimming bath is also included in the group.

Figure 7 shows the main dimensions and marking necessary for a squash rackets court ; the internal dimensions of the court itself are 32 ft long, 21 ft wide and a minimum height of 15 ft to the play line on the front wall, to which must be added at least 2 ft of clear space. Top-light is essential over at least one-third of the floor area of the court. Walls should be of brickwork, which is generally finished internally with patent non-sweating plaster. Floors are usually of polished maple in narrow widths. The entrance doors should be special flush doors with special flush door furniture. It is fairly usual to arrange a spectators' gallery on the back wall, which merely consists of an opening protected with wire netting, the floor being placed about 8 ft 6 in or 9 ft above the floor of the court over the entrance space and possibly some dressing rooms. Steeply stepped seating is desirable in order to allow spectators at the back of the gallery the maximum possible view of the floor of the court. Ventilation of the court may be provided by placing fresh-air inlets behind the " tin " on the front playing wall, and a window or extract fan on the wall at the back of the gallery ; some ventilation can sometimes be arranged in conjunction with the top-lighting, but care should be taken to exclude any possibility of rain entering as the maple floor is easily damaged by moisture.

Artificial lighting is most essential for squash rackets ; very special consideration should be given to this lighting in order to provide sufficient intensity, together with even distribution over the whole court. Lights should be protected against damage by the use of wire mesh.

When changing rooms are provided to serve the squash racket courts only, two rooms are desirable, one for each sex, together with shower baths, lavatory and W.C. attached to each changing room.

Doubles squash courts are now sometimes required. The American standard size for such courts is 45 ft long by 25 ft wide. The height of the play line on the front wall is 20 ft and on the back wall not less than 8 ft, and a somewhat greater height is needed.

Bowls—It is usual to make a bowling green 120 ft square, so that it may be played on in either direction. The actual alley is 20 ft wide. The green should be surrounded by a trough 4 in deep and 8 in wide, covered with a slightly sunk wooden grating. The green is usually sunk below the normal ground level, not more than 18 in, and is surrounded by a grass bank inclined at an angle of about 120 degrees. Good drainage and good turf are essential. (Figure 6, Diagram C.)

Croquet—A croquet lawn is 105 ft long by 84 ft wide, on which are placed six hoops and two pegs in the approximate positions shown on Figure 6, Diagram D. The number of players should not exceed eight.

Clock Golf, Putting, and Midget Golf—No special sizes or areas are required for these games. Frequently, however, clock golf is laid out in a circle 24 ft in diameter ; there are 12 tees, with the hole placed nearer the circumference of the circle at one point. Putting greens and midget golf can be of any size, and can accommodate a large number of players at one time, as each tee and hole are separate.

Among other sports for which space may be required are the following : Archery, baseball, fives, golf and quoits. Some of these are more usually found in special parts of the country or attached to clubs. Golf is the only one frequently connected with public recreation grounds, but the requirements are considered to be beyond the scope of this section.

Table showing the full playing spaces and necessary surrounding areas required for various games compared with number of players

Game	Area Sq. ft.	No. of Players	Area per Player Sq. ft.
Football (Soccer)	131,200	22	5,964
Football(Rugger)	117,600	30	3,920
Hockey	64,000	22	3,000
Basket (Net) ball	8,400	18	466
Tennis (1 court)	7,200	4	1,800
Badminton ,,	2,048	4	512
Bowls (1 alley)	2,730	8	341
Croquet	(Average) 8,820	8	1,102

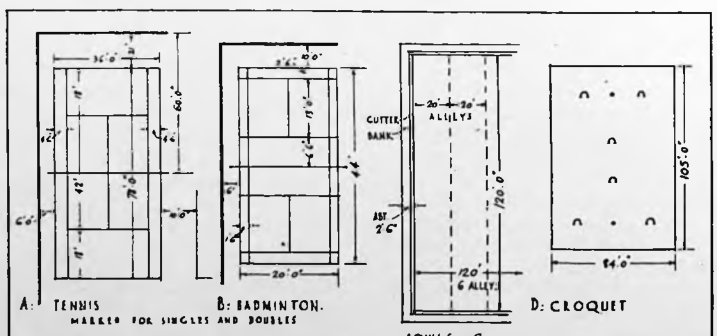


Figure 6

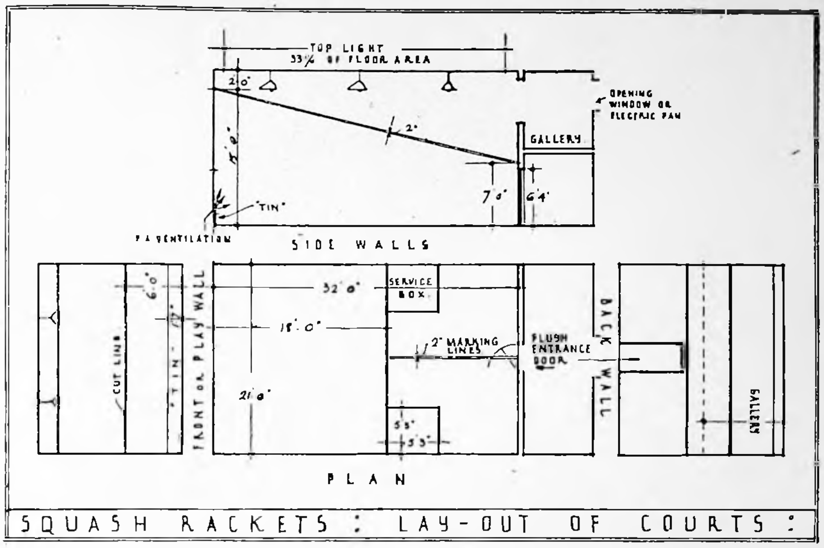


Figure 7

See also sections on "Sports Pavilions" and "Schools" (Storage of Sports Equipment, etc.)

25. *Sports Pavilions*

Introduction—Sports pavilions are required by many organisations and vary accordingly in type and size. It is intended, in the first place, to exclude from this section all reference to social clubs or country clubs, which are rather wider in their scope than mere games pavilions owing to the inclusion of such rooms as card rooms and special restaurant facilities of a more social type, and to discuss these types separately as the occasion arises. The first part of this section is therefore to be devoted to pavilions attached to clubs or schools playing such games as tennis, football, hockey, cricket and combinations of these games, together with those required for croquet, bowls and similar games.

The requirements of pavilions vary from a single room with some sanitary accommodation to large buildings providing many changing-rooms with bathrooms, a tea room, committee room and caretaker's quarters. Some pavilions are also planned with terraces, verandahs and tiers of seats for spectators.

There are few special points in regard to the placing of the buildings in relation to the site and the playing pitches; the most important factor is to place any pavilion accommodating spectators or scorers—for tennis or cricket, for example—so that the sun is behind the spectators during the time that the pavilion is mainly in use, in order to avoid glare and direct sunshine in the spectators' eyes. Large pavilion schemes accommodating and providing catering facilities for many players and their friends should have a service roadway for food and fuel deliveries. It is desirable that the pavilion should be placed in such a position in relation to a particular playing pitch as to give spectators the most satisfactory and comfortable view of the game. When there are several pitches the pavilion is generally related to the main playing pitch or the most important court.

Orientation of Pavilions—Figure 1 shows the positions of pavilions in relation to the main playing pitch usually considered to be the most satisfactory for the spectators or scorers. It is, however, difficult to place the pavilions to provide perfect conditions, as during the period of time that a pitch is mainly in use the sun may move through a large angle. Diagram A shows a tennis court which is usually used for important games during the afternoon; consequently, the pitch is placed with a north to south axis, and the pavilion on the west side, so that spectators' backs are towards the sun. In some clubs having special match courts, the principal spectators' stand is sometimes placed at the end of a court instead of at the side. Diagram B shows the placing general for such games as football, hockey and basket ball, which are mainly played during the early afternoon, when the sun is on the west side; the pitch, as for tennis, has its axis from north to south, and the pavilion placed on the west side. Diagram C shows a cricket pitch which is used during a longer period than is general for most games; a match may be played at any time from 11 a.m. until 8 or 9 p.m., so that it is better if the main axis of the pitch is placed from north-west to south-east, and the pavilion at the north-east end of the pitch.

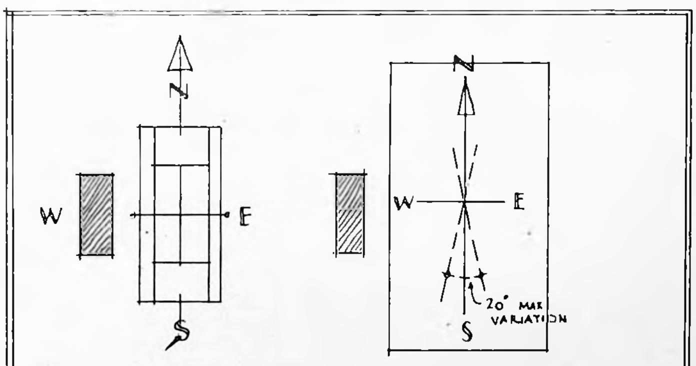


Figure 1

GENERAL PLANNING

The smallest types of pavilions often consist of one large room fitted up with hat and coat pegs and possibly

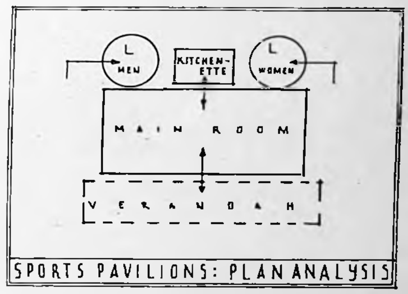


Figure 2

fixed wall seats. Such a pavilion is suitable only for games such as croquet, bowls and tennis, when the players change their shoes only and not their entire clothing. Some sanitary accommodation is always desirable even if it necessitates the use of earth or chemical closets; when sanitary accommodation is provided, there should be at least one W.C. for female players and one W.C. and some urinal space for men. It is an advantage to have a lavatory basin for each sex in the W.C.s if water is available. The W.C.s are frequently approached externally and not from the pavilion, in which case care must be taken to separate the approach for each sex and also to screen the entrances adequately. A very small kitchenette can often be incorporated at the back of the main room and entered from it. Figure 2 shows an analysis of the essential requirements of pavilions of

the smallest types with externally approached W.C.s. Provision should be made in all types for the storage of the tools necessary to maintain the pitches, such as marking machines, mowers, forks, spades, etc., which must be kept under cover and locked to prevent theft. The winter storage of games apparatus such as posts and nets is often provided by using the main room of the pavilion.

Figure 3 illustrates a type of pavilion in which the main room is much larger than in Figure 1 and makes better provision for the service of teas and light refreshments. A secondary entrance is provided to the pavilion and especially for use in connection with the kitchen. A general store is provided as well as a tool room, the latter having external access only for the groundsman. An open-sided but covered verandah is suggested across the full length of the front of the building. The lavatories for each sex are at opposite ends of the building and so arranged that access is available both from the main room of the pavilion and also from the grounds, by way of the verandah. This type of pavilion, like that suggested in Figure 2, is based on no provision being made for changing of clothes, and is therefore suitable only for certain games such as tennis, bowls and croquet.

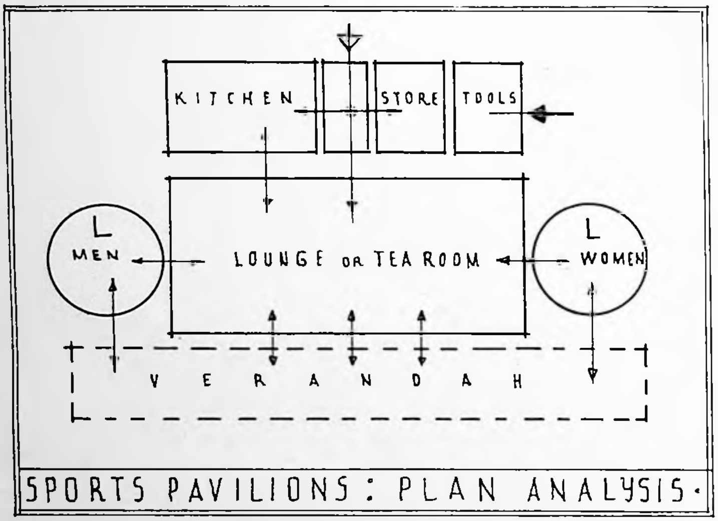


Figure 3

Figure 3 illustrates a type of changing rooms are provided but only for two teams, and is therefore suitable for a small club or school playing cricket, football, hockey or other similar games which involve a change of clothing. The pavilion suggested provides for one sex only in the changing rooms, unless members and visiting teams of each sex share the same changing room, which does not seem to be a regular practice. The main room serves as a general lounge and tea room and the remaining rooms are directly approached from it. The changing rooms can either both be placed on one side of the lounge or one on each side, and have lavatories, baths and W.C.s attached and directly approached from them. The kitchen and service rooms need to be rather larger in area than those suggested in the previous figures, and it is desirable that they have a separate entrance for deliveries. An office for the groundsman or caretaker is suggested, but if this is not required the heating installation may be placed in this position. In the smaller schemes the amount of hot water needed can be heated by means of the kitchen range, or, if gas or electricity is available, by small boilers placed in the kitchen ; but in larger schemes, particularly when large quantities of bath water are necessary, as for football players, a separate hot-water boiler together with fuel storage becomes necessary. Pavilions to be used in winter-time must have adequate heating facilities for the main room, and open fires are very much appreciated. In clubs of importance it is also usual to heat the changing rooms, and a central heating system involving a boiler-room becomes almost essential. The amount of hot water required for washing and baths is usually very large, and the bulk is required for use within a very short time which involves hot water storage tanks of large capacity, for which adequate space must be allowed in some suitable position in relation to the boiler and the fittings to be supplied.

In pavilions providing changing accommodation, and to be used mainly by one sex, provision should be made for a lavatory and W.C. for use of visitors and spectators of the opposite sex who may come to watch a game and stay afterwards to have tea with their friends.

Figure 4 shows a position for the covered verandah which is almost a necessity in connection with some games—especially those played in the summer—and is very desirable as a covered and floored space for spectators in bad weather during the winter.

A plan similar in type to that shown in Figure 4 can be developed as a two-storied building to provide for a second set of changing rooms and lavatories on an upper floor for the use of a second team and their visitors or for two teams of another sex. The approach to the changing rooms on the upper floor can be arranged by means of external staircase or one from the entrance hall between the kitchen and the office leading to a balcony across the long side of the lounge, giving access to the changing rooms at each end ; if the balcony approach is undesirable, a corridor could be formed over the kitchen and office outside the area occupied by the upper part of the lounge.

Figure 5 illustrates a large type of pavilion providing accommodation for home and visiting teams of both sexes. The main room or lounge is used by both sexes as a general club and refreshment room, and, consequently, has adjoining it a kitchen which must be placed in a convenient

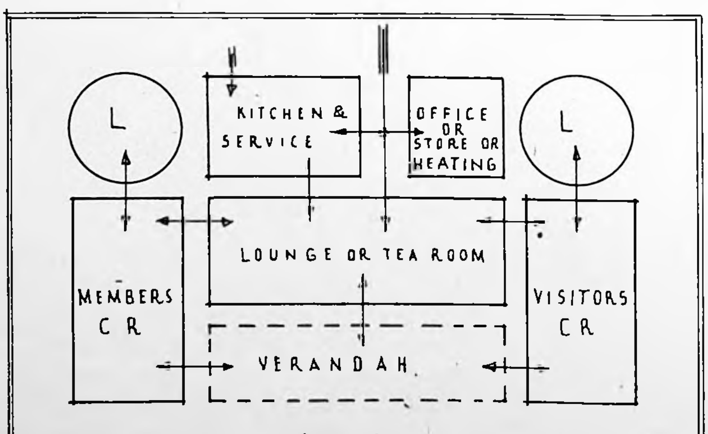
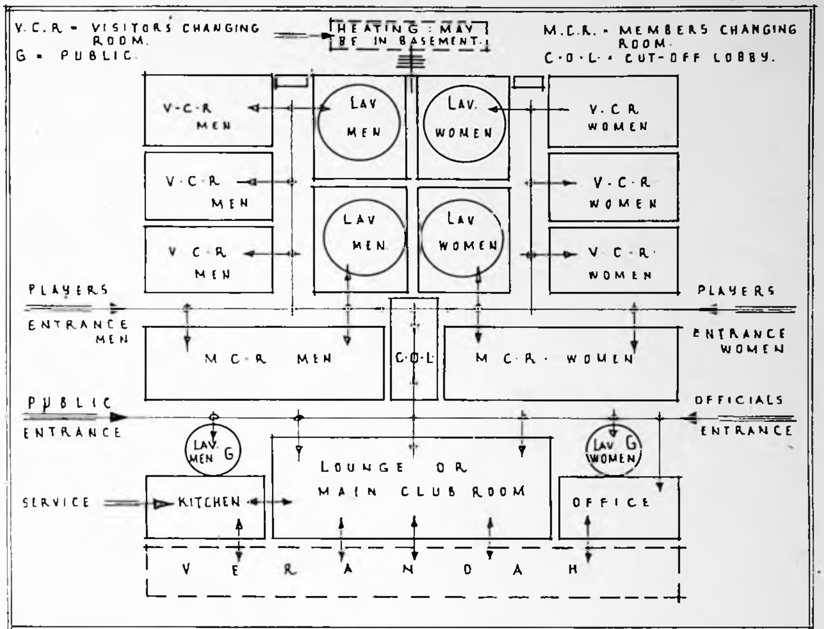


Figure 4

position for deliveries as well as for service to the club room. Clubs of this size usually require an office, which is used primarily by a secretary and/or caterer. This can be used as a committee room, or, in addition to an office, a committee room is sometimes provided. Lavatories and W.C.s for each sex should be placed adjacent to the main club room for visitors other than players.

The main changing rooms may be approached directly from the club room, but are better if separated by a corridor, which may also serve as entrances. The changing rooms for member players and visiting players of each sex should be grouped together with their lavatories, and should have complete cut-off from main circulations, as the corridors in each group are likely to be used by persons passing to and from the lavatories from the changing rooms. It is desirable in pavilions used by players of such games as football, in which the players are likely to become muddy, that they should have a separate entrance from the playing fields to the changing rooms without passing through the club rooms or main corridors, thus confining the dirt and mud to certain rooms. It is usual in most clubs to provide a large changing room for members of one sex, adjoining which is a series of smaller rooms for each visiting team of the same sex as indicated on Figure 4 ; and it is equally usual to provide two separate lavatories, one for members and the other for visitors. The diagram suggests a plan based on a single-story building, with top-light for certain of the less important rooms, mainly lavatories and corridors, but with all important rooms placed on the outside of the building ; if, however, it is required, the same accommodation may be provided on two floors by duplication of the rooms of half the ground-floor plan on an upper floor, and thus placing each sex on a separate level, except the main club room, which is used by both sexes. If a two-storied plan is adopted the club room may be two stories high without interference with the remainder of the rooms. It should be noted that the lavatories, which comprise basins, baths and W.C.s, are grouped together to facilitate services and supplies, while the necessary boiler-room may be planned in a basement directly below the rooms needing the largest amount of heat, namely, the lavatories and bathrooms, thus shortening pipe runs to a minimum.



SPORTS PAVILIONS : PLAN ANALYSIS : A LARGE MIXED CLUB.

Figure 5

Changing Rooms—A changing room may only require just sufficient area for a certain number of persons to dress at one time, and for pegs on which clothes may hang, with space for seats, but other rooms may require, in addition, locker space ; the former type is sufficient for clubs where members or visitors bring their clothes with them, whereas the latter type is more suitable for those clubs where members leave at least a part of their sports clothing at the club between games, as, for instance, in many tennis clubs. Changing rooms without lockers should provide a floor area of at least 10 sq. ft. per person in the better types of private club, but this figure may be reduced to about 7 sq. ft. per person for children and for the smaller types of pavilion. It is usual to provide the changing space, together with the necessary seats and clothes-pegs, round the walls of the room, leaving the remainder of the floor space clear for circulation. When planning changing rooms it should be remembered that each person usually has a suitcase or other bag containing clothes and equipment, which occupy considerable space in addition to that needed in which to stand or sit while actually changing. As shown in Figure 6 gangways between rows of seats with clothes-pegs over should not be less than 6 ft wide if seats are placed on both sides, and not less than 4 ft 6 in if seats are on one side only. The actual equipment, although very simple as regards essential requirements, may be provided in a variety of ways at very different costs. The essential needs are one or more clothes-pegs and some form of seat. Seats should provide at least 2 ft run per person ; they are generally placed about 1 ft 5 in above the floor, and should be from 12 in to 18 in. on width. Boot lockers or racks are often provided under the seats, but doors to these are of little value, and some authorities suggest that it is better to support the seats from the wall, and leave the space below the seat clear of all obstructions to facilitate cleaning, especially in rooms where considerable quantities of mud are likely to be introduced. Pegs should be fixed to wall battens, and it is preferable if each person is allotted two pegs of a hat and coat type. Seats are generally of wood, which should be chosen to be suitable for constant washing. Pegs are generally fixed about 6 ft above the floor. When island seats or racks for clothes are used, windows should be placed on the axis of the gangways, and not on the opposite wall, where light for the back rows is reduced by clothes hanging on the island stands.

Sanitary Accommodation—The requirements of clubs in regard to the provision of sanitary accommodation vary with the type of games to be played and also the amount of money available. Some W.C. accommodation is needed at all clubs, and where water is not available earth or chemical closets must be installed. The number of fittings to be provided should be based on two W.C.s and 8 ft run (or four stalls) of urinal space for the first twenty-five men, with an addition of one W.C. and two urinals for each additional twenty-five men. W.C.s for women should be provided on the basis of one for every ten persons. In large clubs used by a number of teams it is usual to group all the W.C.s and urinals together, rather than attach a part of the total provision to each changing room or lavatory.

Lavatories—Lavatory basins are sometimes provided in the changing rooms themselves, and sometimes in separate lavatories. If lavatory basins are placed in changing rooms, some economy of space may usually be achieved, but services are apt to

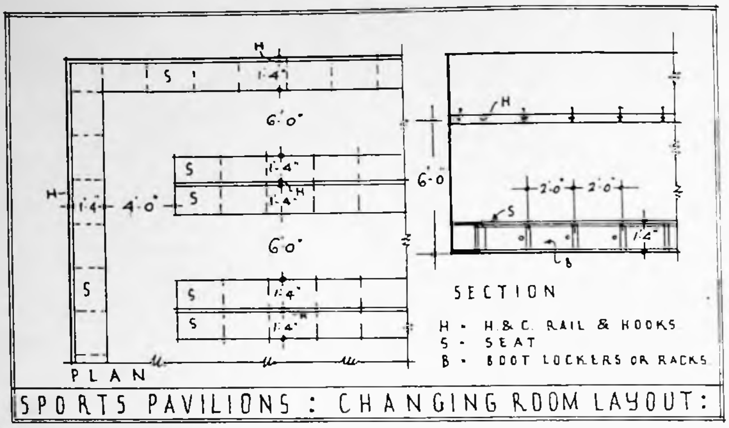


Figure 6

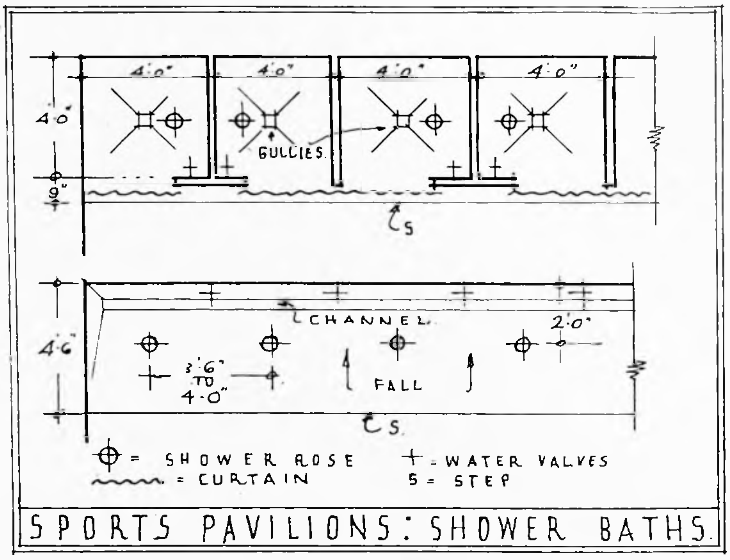


Figure 7

be more costly owing to increased lengths of pipe runs and drainage. The great drawback to basins in changing rooms is the risk of water, dirt and dampness being splashed and trodden in rooms where shoes and boots are left about, and where clothing may be hanging. Basins in changing rooms of clubs for use in connection with games such as tennis, bowls, and cricket, which are mainly free from mud and dirt, are less harmful than where games involving mud are concerned. Full details as to average sizes and much general information is given in the section on " Lavatories : Public and Communal."

Direct access from changing rooms to lavatories is advantageous, but when there are a number of changing rooms using one lavatory it is better not to have direct approach. If corridors are used for circulation between changing rooms and lavatories great care must be taken that there is an adequate cut-off from draughts and from club rooms on corridors used by the opposite sex or by non-member visitors ; corridors are frequently used by players only half-dressed.

Bathrooms—Bathrooms present a more difficult problem ; a bath is more or less essential after some games, and in many clubs of the more expensive type the players desire bath facilities after all games. Baths are usually grouped with lavatories. Small clubs concerned with games in which only a few persons finish playing at the same time often provide a single bath of an ordinary domestic type for each sex. In larger clubs the number of baths are increased, but in those in which many persons finish playing at the same moment, as in football or hockey, bathing is usually arranged somewhat differently ; in clubs of this type a number of shower baths are often installed together with small plunge baths. It should, however, be remembered that shower baths are not very popular with women in this country. Some clubs provide large shallow baths about 12 or 18 in deep, and 6 or 8 ft long, by about 4 ft wide for washing feet and knees before using the plunge baths. These are very useful in Rugby football clubs, but it must be remembered that such baths and plunge baths require very large quantities of hot water—although probably less than if a large number of persons have separate showers, or if tub-baths are used. Tub-baths in clubs of an expensive nature—for squash rackets and tennis, for example—are sometimes provided at the rate of one bath to each two persons of the capacity number of the courts, but in clubs for games involving many players this proportion is impossible to provide except at very great expense, and numbers should be based on one tub-bath to four persons, or one shower bath to six persons ; even this allowance is very generous in clubs having, say, three games of Rugby football (ninety persons) finishing about the same time, and when such large numbers are involved shower baths together with plunge baths become essential. Figure 7 illustrates two types of shower bath and the space required ; Type A shows each bath enclosed with a screen or division, while Type B is a range of shower baths without separation. Type A is to be preferred to Type B, but is more costly ; the space occupied per shower is approximately the same in both types. It should be noted that the controls for the water are placed on the side wall in Type A and on the side of each section in Type B, and not centrally on the back wall, a position which is most inconvenient. Neither type provides for dressing-rooms directly attached to the shower baths, although these may be required in some clubs ; information regarding the arrangement of shower baths with dressing-rooms attached is given in the section on " Factory Buildings," but in better clubs the space allowances there given might with advantage be on a somewhat more generous basis. Separate bathrooms fitted with a normal tub bath are illustrated on Figure 8, which shows the minimum space requirements ; these figures are based on the assumption that the bathrooms are not used for general dressing purposes—for which the general changing rooms are employed. If dressing-rooms are required, a lay-out based on two dressing-rooms leading into one bathroom may well be adopted, as suggested in the section on " Factory Buildings " previously referred to. In Figures 7 and 8 the difference in area required per person for each type should be noted and it should be particularly borne in mind that shower baths may be used by a far greater number of persons in a given period of time than tub-baths.

Large plunge baths vary considerably in size ; they are sometimes provided as a single unit in a corner of a lavatory or changing room, and sometimes as a range or three or four baths in large pavilions for use by schools and university clubs. It is usual to install them in conjunction with shower baths. When single

plunge baths are used they are usually about 7 ft wide and 10 ft long, and when in ranges the units are usually about the same size or rather smaller. The depth varies from 2 ft to about 4 ft 6 in, but about 3 ft seems more general, since the water level must be kept well below the floor to avoid risk of sudden flooding if several persons enter at the same moment. Figure 9 illustrates a typical range of plunge baths based on average dimensions.

Locker Rooms—Locker rooms are not often provided in clubs, except where games such as squash rackets, tennis and golf are played; golf clubs are discussed later in this section. Individual lockers should be at least 12 in by 12 in on plan, and are usually 6 ft in height, unless double rows are introduced, when the height is reduced to about 3 ft. Lockers and their spacing are referred to in other sections. If seats for changing are not required, changing room space having already been provided, the gangway widths between rows of lockers may be reduced to 3 ft. Lockers, as in other types of buildings, may be of wood or metal, although the latter is much to be preferred.

Club Room—This room has to serve for many purposes in most of the types of pavilion already mentioned, although its main purpose is generally for the service of meals. Except in small pavilions, when it cannot be avoided, the club room should not be used for general circulation between other rooms. The room should be rectangular in shape, with one of the long sides towards the playing area; this long wall should have as much glass area as possible, which should be capable of opening in the form of doors if the pavilion is to be used for summer games. Fixed furniture or fittings are not usually required. If the pavilion is to be used during the winter, some form of heating is essential and an open fire seems to be much appreciated; when open fires are provided, they should preferably be placed on the long wall opposite the windows. The entrance from the kitchen or servery to the club room should be placed as centrally in the room as possible to reduce the time of service. Some clubs use the main room during the evenings for occasional purposes, such as bridge, club meetings, table tennis, badminton and dances; if the room is to be used for badminton the minimum dimensions are 60 ft long, 26 ft wide and 25 ft high, while slightly greater length and width are desirable. Table tennis sizes are given in the section "Community Centres."

When pavilions are planned on two floors, and the club room has a large floor area, it is often an advantage to have the room the full height of the two floors and in such a plan the circulation to upper floor rooms may be by means of a gallery or balcony open to the club room and lighted from its windows.

The area required for club rooms has either to be based on the minimum sizes needed for certain indoor games or, as is more usual, on providing seating and table space for a minimum number of persons requiring a meal at any one time; if the latter basis is to be used, allowance must be made for a certain number of friends, supporters and non-playing persons such as umpires, scorers, touch judges and committee. A floor area of at least 8 sq. ft. per person should be allowed as a minimum when long tables are used and this figure should be increased considerably if small tables to seat, say, four persons are adopted; these areas allow for gangway or service space where accommodation is for 30 persons or more. Clubs to be used in summer time only for games such as tennis must calculate for meals being served over a longer period than in the case of winter games—for instance, a football match—when 30 persons and their guests require service simultaneously; in summer time the surrounding ground and open verandahs may also be used for meals.

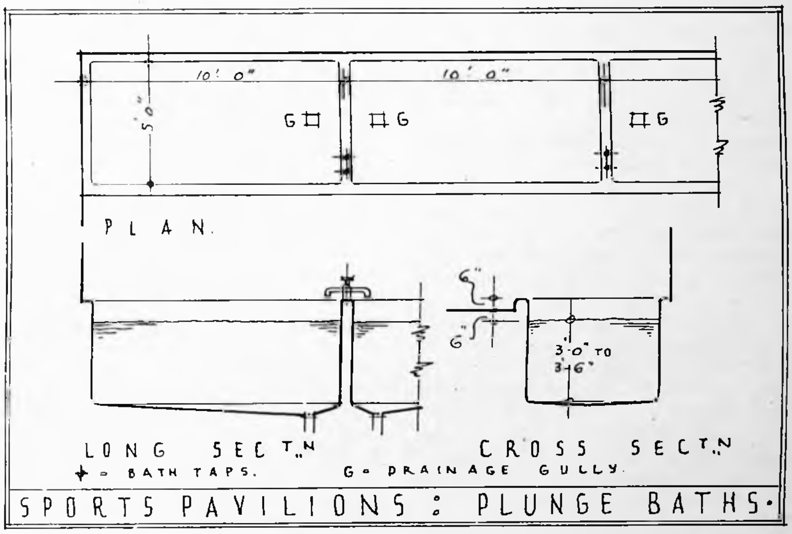


Figure 9

Kitchen—The requirements of kitchens vary very much. In some pavilions tea only has to be served, whereas in others full meals—generally luncheons—have to be provided. Many clubs, however, rely on the main part of the cooking being done elsewhere, and provision is therefore necessary only for heating certain dishes, such as vegetables, and for supplying tea and coffee. The important provision that is really essential is to have sufficient space in the form of shelves or tables on which the large number of meals may be put ready for very rapid service to

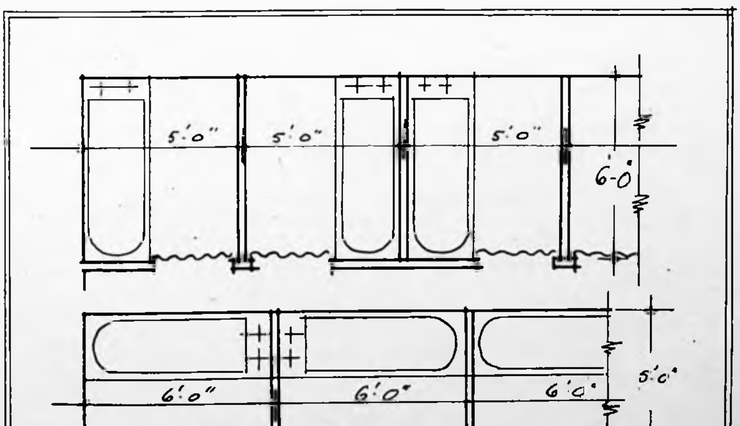


Figure 8

the club room. The equipment needed is usually very simple, and consists of urns or stoves for water and coffee heating, sinks and draining-boards and ample storage for china and glass. Larder space is not, as a rule, required on a very generous scale, since little food has to be kept from day to day.

Verandahs — Covered verandahs and open or covered balconies should be at least 7 ft wide in order to provide gangway space in addition to the area needed for chairs ; it should be noted that the latter are often deck chairs. It is preferable if the ends of verandahs and balconies are closed as a protection against wind. The effect of the roof cutting off light from club rooms placed behind them should be remembered, and, if height in the club room permits, clerestory lighting should be provided.

Verandahs should be raised well above the ground, partly for dryness and partly so that persons seated on the verandah may see over the heads of persons standing between the building and the playing pitch. Balcony provision is often made in cricket pavilions for the scorers, who must have a clear view of the playing pitch and be visible to the umpires. The score board is usually placed close to the scorers and raised high above the ground, so that all spectators may see it ; the size of the score board varies very much, according to the size of the ground and the importance of the club, and consequently no useful dimensions can be given in this article.

Store Room—It is most important that a room of adequate size is provided for storage of equipment, especially in those pavilions which are used for different games in the summer and winter, and in which the main club room is in continual use and therefore not available for storage purposes. Tennis boundary nets, cricket practice nets, football and hockey goals all require not only ample floor space, but also considerable height and many pavilions do not provide nearly sufficient space for the purpose. External access is desirable to store rooms, and if they are to be used for housing machines such as motor mowers, care should be taken to provide easy access and doors of adequate width.

GOLF CLUBS

Golf club houses are somewhat different from pavilions for other games, since they are in more constant use all day and all the year round than other pavilions ; also more facilities for members, such as dining-rooms, games rooms, club rooms and bars have to be provided. Accommodation for players of both sexes is generally needed, besides certain rooms for non-members connected with the club, such as the professionals, caddies and club secretary. It should also be remembered that the golf club may, in many instances, tend to merge into the country club, with bedroom accommodation for members and guests, although in the present series of articles this residential type is not included.

The club rooms are generally grouped together for purposes of refreshment service ; locker rooms for each sex form separate groups, together with changing rooms, lavatories and drying rooms. The dining-room must be grouped with the necessary kitchen, stores and staff rooms. The rooms for the professional and caddies are sometimes attached, and form a wing of the main club house ; in other schemes are detached. A special room is often provided for committee purposes and adjoining this a secretary's room is usually placed.

In addition to the direct approach to the main entrance of the club and its public rooms, access is usually needed directly from the course to the locker rooms, so that players may take their clubs to their lockers and change their shoes before entering the general rooms. Many clubs set aside special rooms for the use of men or women members only and these must be planned for easy communication with the locker rooms of the same sex. Figure 10 illustrates an analysis of the general plan circulations of a golf club house, showing the relationship of the various rooms.

The general rooms do not call for very much special comment, as the detail and size of such rooms depend largely on the anticipated number of members ; the space to be allowed per person in the respective rooms is discussed in other sections under such headings as "Restaurants" and "Billiard Rooms." The positions having the best aspect and views of the course should be given to main lounges and dining-rooms ; these rooms should be rectangular in shape, and have windows on one at least of the larger sides. Locker rooms and service rooms may be placed in positions with less good aspect and views. The area occupied by locker rooms is generally large in proportion to other rooms.

Most golf club houses are one-story buildings unless they have bedrooms or a steward's flat placed on one or more upper floors. In some clubs the rooms for lady members are placed on an upper floor. Bedrooms, when provided, are planned on similar lines to an hotel, but there is generally a greater demand for single rooms than double rooms. Bedrooms may be on the small side as far as floor areas are concerned, since they are generally not occupied by the same person for more than a few days continuously. All sleeping accommodation should be carefully cut off from public rooms used by resident and non-resident players. As a rule, no separate public rooms—such as lounges or dining-rooms—are provided for resident members.

Much of the planning of the public rooms is dependent on proper grouping to provide bar and light refreshment service to a number of rooms. Lounges, bars and billiard rooms should, as far as possible, be planned round one central bar or service space. Similarly, rooms requiring kitchen service, such as lounges, tea terraces and dining-rooms, should be placed near one another.

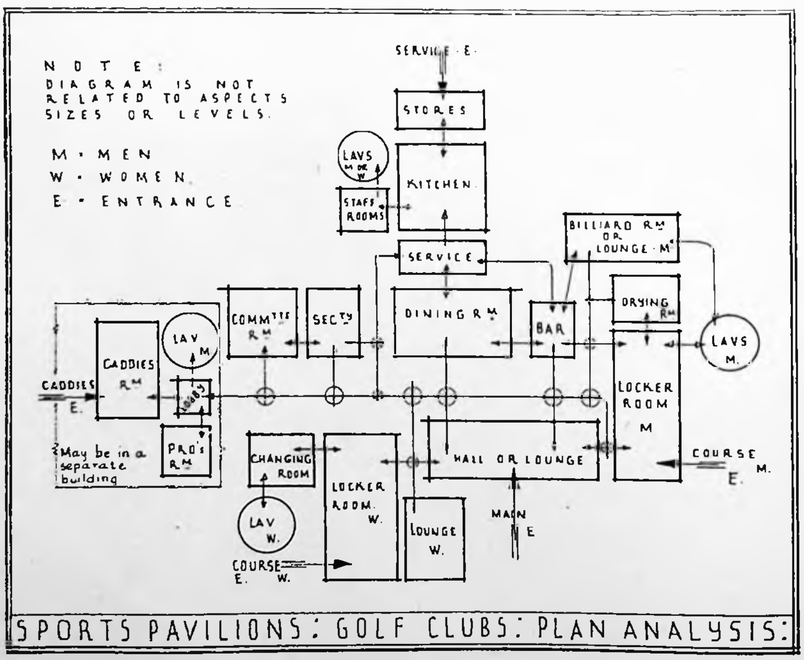


Figure 10

Lavatories, etc—Lavatories, cloakrooms, and W.C.s should be grouped for each sex, and should be placed near any public rooms set aside for the exclusive use of one sex. It is undesirable that locker rooms should open directly off any public room except a main entrance hall.

Lockers are needed in most club houses for a large proportion of the total number of club members, since they are used for the storage of golf bags and clubs, playing clothes and shoes, together with spare balls and other small accessories, all of which members may wish to leave at the club between games. Some clubs provide small lockers about 9 in by 9 in and 4 ft high, in two tiers, but others find larger lockers, about 12 in by 12 in, and 6 ft high, in single tiers, are more desirable. Some clubs provide even larger lockers for part or the whole of the membership. Lockers should have at least one shelf, and preferably two, one near the bottom, to separate clubs and clothes from shoes, and the other for hats, golf balls and other small objects.

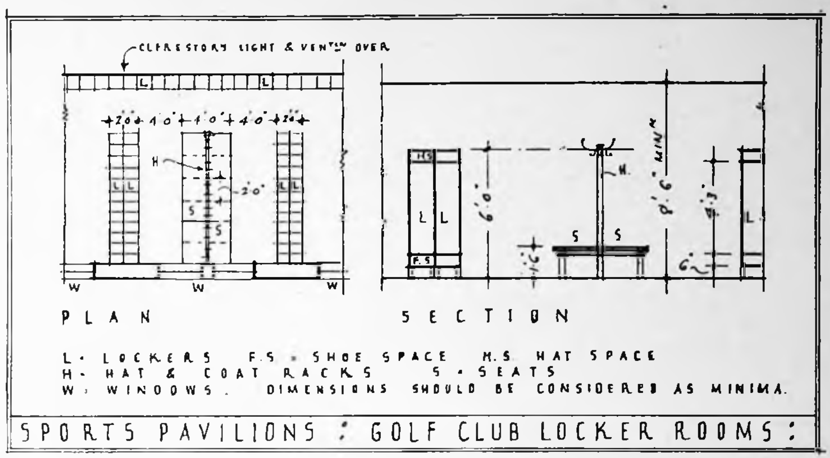


Figure 11

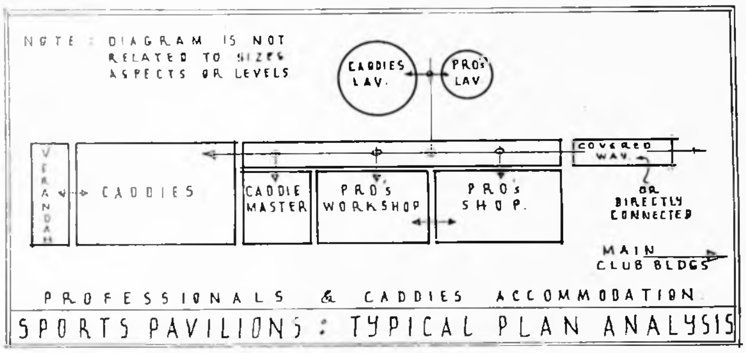


Figure 12

In addition to the lockers, seating and hanging space for clothes is required for the use of members changing and while playing. The lockers are usually used for storage, only coats and other clothes being left on the clothes stands while playing. Figure 11 illustrates typical spacing for a golf club locker room, together with a typical section. The centre fitting comprises a double-sided seat with a centre rack for clothes hooks or pegs. These fittings will only provide a proportion of the locker numbers in the room, since all members having lockers are unlikely to be playing at any one time. Gangway spaces of at least 4 ft are necessary between the seat fronts of the central fittings and the lockers to allow adequate changing room space. Windows in locker rooms should be placed 3 ft 6 in or 4 ft above the floor, and reach to as near the ceiling as possible. Cross ventilation is most important.

In small clubs, lavatory basins are sometimes placed in the locker rooms, but in larger clubs it is usual to have separate lavatories grouped with the W.C.s or divided from them as a separate compartment. Many clubs provide some facilities for bathing—often in the form of shower baths with small dressing-rooms attached, similar in general lay-out to the bath accommodation shown in Figure 11 in the section on " Factory Buildings." In the lavatories it is desirable to provide a small shallow sink in which golf balls may be washed, it being undesirable that lavatory basins should be used for this purpose.

Drying-rooms—Attached to and approached from locker rooms or lavatories should be placed a drying-room for wet clothes. Separate drying-rooms for each sex are preferable to a central drying-room. Heating coils or pipes connected to the heating system are generally used for the drying-room, and are placed near the floor; in addition some ventilation for the removal of humidity is needed. The equipment usually provided consists of heavy rods, from which clothes hangers may be suspended and metal tube shoe-racks.

Professional and Caddies—Accommodation has to be provided for the professional and for the caddies; the professionals usually require two rooms—one for use as a showroom or shop and the other as a workshop, and one or two rooms are provided for the caddies. Where two rooms are provided, one serves as an office and workshop for the caddie master. Lavatory accommodation and facilities for the drying of wet clothes should also be provided for the caddies. The equipment necessary is of a simple nature in all the rooms. The showroom requires racks and shelves for the display of clubs, golf balls and other equipment. The workshop needs a sink and ample bench space with good daylight. The caddie master needs a table or other writing space, a sink, bench, and fixed seating, while the caddies need fixed seating, generally placed round the walls. Figure 12 illustrates an analysis of the necessary accommodation for the professional and caddies.

Car Parking—Many clubs do not pay enough attention to the provision of sufficient car parking space properly arranged for the easy entrance and departure of vehicles. In many clubs a very large proportion of the members arrive at the club in cars, and when proper spaces are not provided, acute congestion often occurs. Some covered garage space for use of the staff is often required. Full information regarding car parks is given in the section on " The Motor Vehicle."

Lay-out—Care should be taken to plan properly the ground surrounding a golf club house—for instance, as a garden incorporating terraces and lawns. The terraces and lawns are useful in summer as an extension of the lounge and even the dining-room. Such lay-out should lead by transitional and suitable design to the first tee of the golf course.

26. *Hotels*

Introduction—This section is confined to what may be called the hotel proper and includes only the planning of the types in which sleeping accommodation is a primary factor and not those which depend chiefly on the profits of bars, which should be more correctly termed Public Houses, and where bedrooms for guests are of little or no importance from the point of view of the capital investment, or the return on that capital. Further, it is not proposed to consider the type of hotel which is mainly dependent on resident guests, a type which is closely similar to service flats, and is well described by the American term " apartment hotels."

The basic principles of hotel keeping are summarised in the word " service," and everything connected with hotels has to become an adjunct to producing that " service " for the guests. The five essential factors for which good hotel keeping and therefore planning must provide are :—

(1) Good and quiet sleeping facilities.
(2) Clean and comfortable rooms.
(3) Good food.
(4) Adequate service by the staff of all departments.
(5) Hospitality.

All these factors must be introduced at reasonable cost to the guest while, at the same time, a reasonable profit must be secured for the investors. All this depends very largely on the efficiency of the building from the standpoints of planning, construction and equipment.

The primary divisions of the hotel building are shown on Figure 1, and are as follows: Firstly, the management, with all its subsidiary sections, such as accounting, buying, upkeep, staff, etc. Secondly, the bedrooms and bathrooms, with which should be coupled a third section, the public rooms, such as lounges. The fourth group comprises several sub-divisions, all concerned with food services ; the sub-divisions are kitchens, restaurants, cafés, bars, ball and banquet rooms. The fifth group also comprises many sub-divisions, including all those portions of the hotel building which are themselves partly or entirely self-supporting, or which may be operated as separate concerns, paying rent to the management of the hotel proper ; shops, kiosks, swimming pools and Turkish baths come into this category.

Hotels must appeal not only as a home for the traveller and in some cases as temporary business headquarters but, to local residents as a place of entertainment in-so-far as the bars, restaurants, banquet and ball-rooms are concerned. It must be remembered that in some respects hotels vary very greatly according to the type of guest and, to some extent, according to situation ; some will cater for the leisured rich, some for the wealthier type of business guest and others for commercial travellers. In the same way a seaside hotel has clients living a different hotel life from a " railway " hotel in a large business centre. Each slight variation must be considered from the first, as each may have effects on the final plan and equipment of the buildings. Certain general factors will, of course, remain constant, but the architect must realise how each different type of guest will tend to use the various parts of any given scheme.

There seems little doubt, although some hotel financiers may still disagree, that the successful hotel must be planned and built by close working of the architectural and managerial interests from the very commencement of a project ; even, if possible, before the site is purchased. The hotel, once built, has to stand until it has depreciated to such an extent that it is no longer serviceable for its original purpose and, although improvements may be made to some extent, they can only be effective within temporary limits : therefore the building must be planned and equipped in such a manner that there will be a constant market for its services for many years without excessive upkeep and replacement costs, and without the site becoming unsuitable through developments in the neighbourhood, which might have been foreseen, or at least anticipated.

Hotel Staff—Before discussing the details of hotel planning, a further matter of general organisation must be reviewed, namely, the staff required for the various departments and the contact of various parts of the staff organisation with the guests. The size of the staff of an hotel varies from about one member of staff to each six guests when the building is fully occupied, up to a proportion of one member of staff for each guest, which latter figure may easily come about in a luxury hotel which has a large catering department dealing with outside visitors. As a normal example it is interesting to note that 118 is the total staff figure for a certain provincial hotel having 130 bedrooms, 190 beds, 12 sitting-rooms, a restaurant seating 120, lounge, two bars and three rooms for dinner, dances, etc., seating 60, 130 and 250 respectively, and having an all-the-year-round trade. This figure of 118 includes the manager and is roughly made up into four groups. First, rooms, 37, including porters. Secondly, catering, 58. Thirdly, wines and spirits, 14. And lastly, engineering and upkeep, 9. Figure 2 illustrates the organisation of the entire personnel connected with an hotel from the shareholder to the least important members of the staff. All are controlled by the manager through his general office and then become more or less separate units only partially dependent on one another. The guest comes into direct contact only with certain sections of each department and has direct dealing

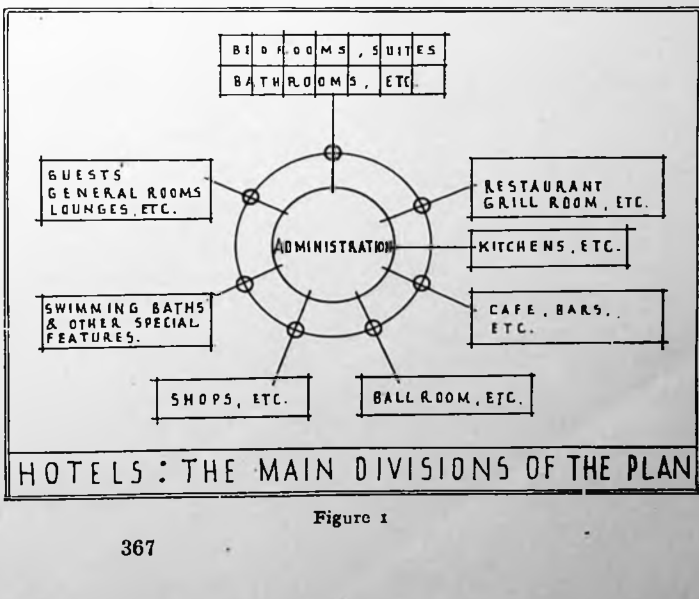


Figure 1

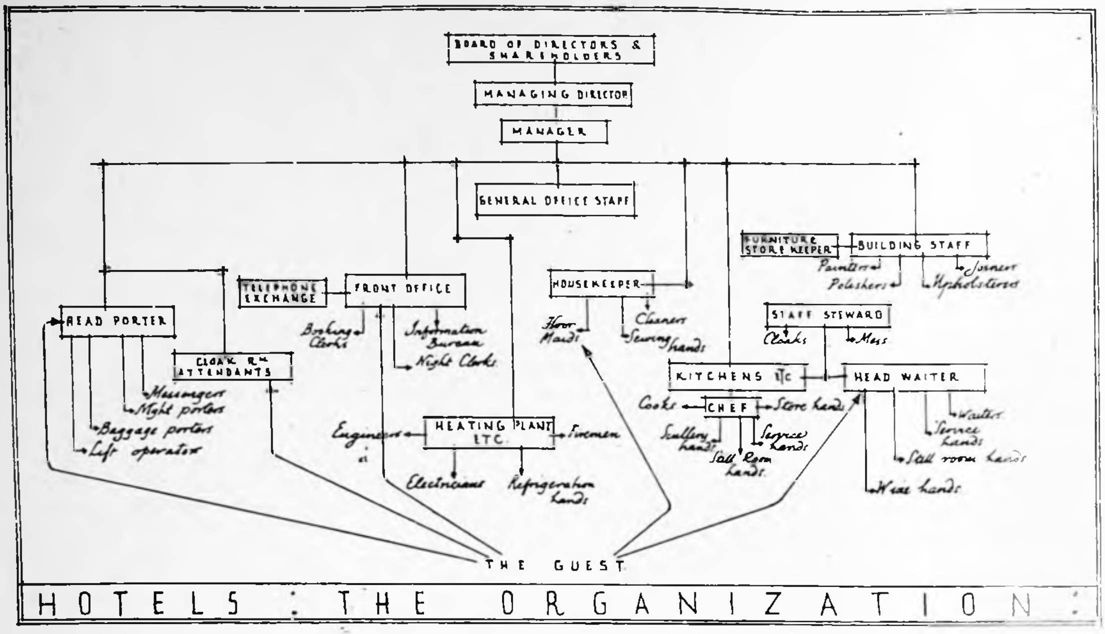


Figure 2

with a few members of the staff who are, in general, the departmental heads.

Types of Hotel—It is difficult to divide hotels into separate types as there are always many whose trade includes two or three different sections of the public. The more general divisions are large city hotels, smaller city hotels, hotels in seaside or other resorts, and the smaller hotels in the lesser towns. Each of these groups may be divided into luxury, good, medium and cheap types, each concerning itself with guests prepared to pay according to various scales of charges and each expecting value for money in return.

Size of Hotels—Hotel building presents two rather different problems depending on whether the scheme is concerned with an entirely new project or with the rebuilding of an existing hotel. The size of schemes falling within the latter category may be far more easily assessed, but for new projects it is an extremely difficult matter to decide how many rooms to provide, how many public rooms may be needed, what outside restaurant business may be expected. The size has to be decided by weighing up the merits of many factors, both as regards the situation of the town in which the hotel is to be built, the attractions of the town, both commercially and as a tourist centre and the number and proximity of similar hotels. New hotels should, whenever possible, be so planned that future extensions can be provided when increased business justifies increased accommodation; it is unwise to build a larger scheme than is necessary for present needs, as the interest on the capital costs of the empty portions becomes a severe tax on profits.

Sites—The choice of suitable sites for hotels presents many difficulties and is usually a matter of choosing from among a number of possible sites that which has the greatest number of good features or the fewest defects, as no site is likely to have all the merits which are desirable.

The main factors to be considered may be roughly divided into three groups, as follows:—conditions of surrounding property, conditions relating to the site itself, and financial aspects of the site. In addition to these three groups there are also a number of miscellaneous matters which have some bearing on the selection in certain cases. The following are the factors affected by surrounding properties:—

(1) Proximity of transport, especially railway stations.
(2) Existing or growing social centre.
(3) Special attraction in location, such as proximity of parks or open spaces.
(4) Easy access to business districts and amusements.
(5) Residential or non-residential area.
(6) Quietness at night.
(7) Access for service deliveries.
(8) Garage facilities within easy access.
(9) Suitability of ground-floor street frontages for shops.
(10) Class of surrounding property and freedom from noise or fumes of industrial buildings.

The factors affected by the site itself are mainly:—

(1) Size and slope of site.
(2) Orientation.
(3) Relation to surrounding property, including matters of easements and building heights.
(4) Relationship to traffic in surrounding streets.
(5) Good sub-soil to eliminate excessive foundation costs.
(6) Possibility of providing garage and/or parking arrangements.

The financial factors are:—

(1) Well-established and increasing land values.
(2) Experience of other buildings on similar sites.
(3) Possibility of landowner's assistance in financing of scheme.

Each factor must be weighed up and a decision made from the complete analysis as to whether the site is suitable for an hotel and, if so, for what type of hotel.

A commercial hotel needs to be nearer the business section of a city than a first-class hotel; prospect, noise and light are also of less importance for commercial hotels. The business man needs to be in an accessible position in relation to transport. Hotels proposing to have large restaurant accommodation should be near "crowd" centres and amusements. A first-class business hotel can often be placed on a comparatively small site in a good district where a cheaper grade of commercial hotel would be unsuitable, the reason being that a high income derived from interest on a ground value involves first-class prices for a number of rooms, which would be much the same whatever the class of the hotel. The areas of rooms vary only very slightly with the type of hotel. In sea or riverside schemes, or inland resort hotels, proximity to local attractions is of the utmost importance, including the surroundings of the site; as private or public gardens. An important matter, sometimes overlooked in the preliminary stages, is the ob-

taining of easy access for goods to the kitchens and stores. Traffic in the surrounding streets should be considered from the point of view of many vehicles standing at the main doors at any one time, occasionally for long periods. Entrances to restaurants and ball-rooms must be easily accessible and, if possible, some space for parking waiting vehicles should be provided.

Figure 3 illustrates three typical hotel sites. Site A is small and rather congested ; the main entrance is placed in the most important street and the service entrance as far from it as possible in the side street. Site B has a road on each side and the plan is such that vehicles enter the site to reach the main entrance, leaving a small area for parking ; the service approach is in the back street. Site C is also a corner site as in A, but has the larger frontage to the main road ; the building is set back to allow parking space and also so that vehicles may reach the door without passengers having to cross the pavement. Two subsidiary entrances are provided which serve rooms such as the grill room and ball-room, visitors to these rooms being thus separated from visitors to the hotel proper. The service entry is again at the back of the site, the vehicles pass under part of the building and by means of a ramp make their deliveries to the basement at the level of the store-rooms ; an arrangement by which vehicles avoid having to stand in the street while being unloaded. Congestion of traffic in the neighbourhood of a good-class hotel may materially affect its popularity.

General Planning— When the general planning of an hotel is considered it must be divided into its essential sections, which can be classed in four main divisions. Firstly, the public rooms, such as the entrance hall, lounges and dining-rooms ; secondly, rooms for functions, such as dinners, dances and social entertainments ; thirdly, bedroom floors ; lastly, the services, such as kitchens, boiler-rooms and accommodation for similar equipment.

By far the most important is the bedroom group and the typical plan on which it is arranged. The general shape of the plan of the typical bedroom floor is the governing factor of the whole design, and it is essential to settle this before anything but the bare outlines of the general plan are decided, together with the positions of the main entrances, staircases and lifts. The reason for making the bedroom floor such a deciding factor in the planning is that bedroom accommodation should be considered as the main thing which an hotel has to sell, and the income and success of the hotel depend to a very great extent on the satisfactory and economical lay-out of these floors. The basis of the bedroom lay-out should be the bedroom unit and not necessarily the steel lay-out, which should be subordinate to the bedroom unit plan.

The bedroom plan shapes most generally adopted for hotels are illustrated in Figure 4, but, except when the dimensions of the site make it essential, a plan shape which builds up the perimeter of the site around internal courts should be avoided and shapes such as the " E," " H " or " X," or multiples of them, should be preferred. The reason for using " open " or three-sided court types is to provide as many " outside " rooms as possible, as rooms overlooking internal courts are not popular among guests, except possibly when very noisy streets surround the site. The maximum number of " outside " rooms or rooms " with a view " should always dictate plan shapes for seaside and other resort hotels, and even for all hotels on uncongested sites.

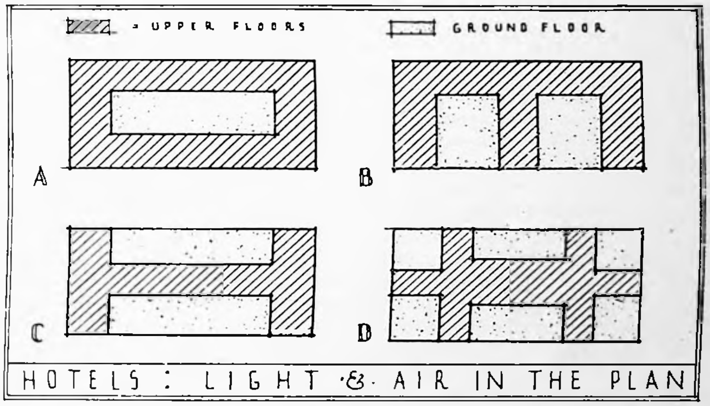


Figure 4

Below the typical bedroom floors it is usual to build over the greater part of the site the public rooms such as lounges and restaurants, as these rooms may be top-lighted and artificial ventilation is now becoming recognised. This eliminates the provision of many of the ventilation areas or courts which were necessary in older schemes.

The height of the building is generally controlled by regulations or surrounding buildings, and care has to be taken that the public rooms are not so high as to prevent the construction of an extra floor of bedrooms in a given total height. Public rooms should, as a general rule, be placed on the ground floor and sometimes at basement level. Occasionally public rooms limited to the sole use of the hotel guests and not for casual visitors are placed on the first floor, but this is apt to confuse, or at least make difficult, the planning of that floor as it is not easy, in these circumstances, to plan bedrooms and public rooms which are absolutely separated.

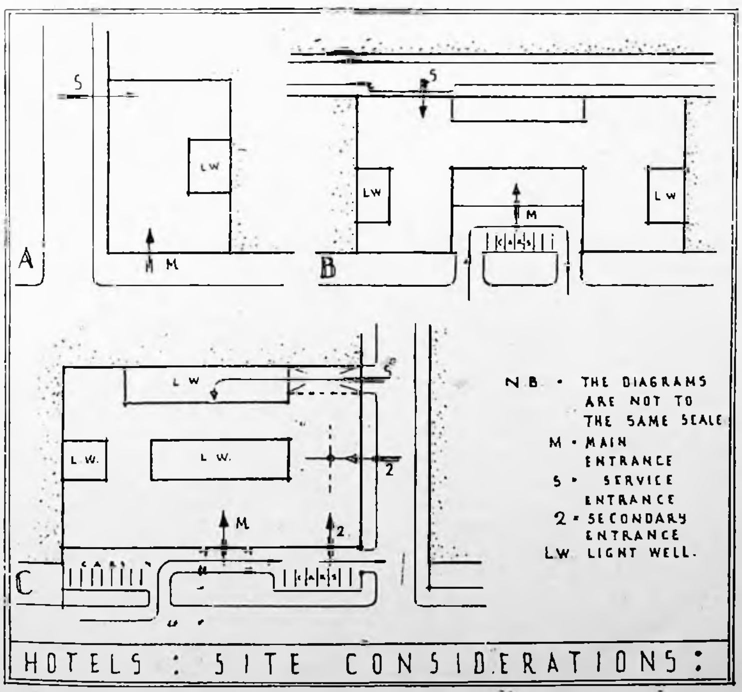


Figure 3

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A fact not yet realised in Europe, but which has been accepted in America, is that rooms on higher floors are less noisy, less dusty, and receive more light and air than those on lower floors, and should therefore command higher rentals if a good and adequate lift service (vertical circulation) is installed.

The placing of the service and power units of the building, although these are unseen, should have careful consideration, as this section is really of greater importance to the guests' comfort than even the public rooms. These service units must be placed in close relationship to those rooms which need the greater part of the various types of mechanical or service output and must also be considered very carefully from the point of view of the vertical communications—leads, pipes, ducts, etc.—which have to be taken to all floors and through all floors.

The American hotel is, on the whole, in advance of the English one in so far as the actual building and equipment are concerned, but much of this is due to American architects being able to build to greater heights, avoiding restriction of the public rooms. Increased efficiency also arises from the general acceptance of mechanical ventilation to bathrooms and to almost all the rooms on the lower floors; this permits of many economies in space planning. It must be borne in mind, however, that mechanical ventilation has only a limited approval by the authorities in this country, while the public do not, on the whole, approve of it, especially in rooms such as bathrooms, although this is partly due to prejudice and partly to the unaccustomed absence of windows and daylight.

Referring to the general size of hotels, one important American authority suggests that the basic test of the efficiency of an hotel plan, from the standpoint of profitable operation, is the amount of cubic content per guest, and suggests as a guide that a carefully planned hotel of a good-class character, for 200 guests, should not exceed one million cubic feet, exclusive of shops or other external space producing satisfactory rent returns.

By analysis it seems, however, that few hotels will stand this test if many bathrooms have to be provided in proportion to the number of bedrooms, but the figure does provide a useful guide.

Entrances—Entrances to hotels are of four main types. Firstly, there is the main entrance to the hotel itself. Secondly, there are subsidiary entrances, either to the hotel or directly to rooms, such as restaurants and ballrooms, which are likely to be used mainly by outside visitors rather than the hotel guests. Thirdly, there is the luggage entrance and, lastly, the goods entrance to the service departments of the hotel.

The main entrance should be from the most important street adjoining the site and the subsidiary entrances to the hotel proper may be placed in other streets, but it should be remembered that every additional entrance involves extra staff, such as porters, for supervision, the cost of which frequently cannot be justified. All entrances likely to be used by visitors should lead to the main vestibule, and the main entrance must be placed adjoining the main vestibule where the various desks for room clerks, enquiries, cashier and head porter are situated. Luggage entrances should always be placed close to the main entrance so that luggage may be removed quickly from waiting cars or taxis, to avoid the necessity for these having to drive to another place away from the main entrance to unload. The proximity of the luggage entrance is very important, when guests are leaving the hotel, to avoid delays. Except in very small hotels, luggage, other than small hand baggage, should never be taken through the main entrance into the vestibule, but should go to bedroom floors by means of service lifts. The passenger lifts should not be used for this purpose. Subsidiary entrances leading to special rooms, such as the grill room or banqueting suite, should be so placed that vehicles arriving at these entrances do not disturb the main hotel entrance; also, if special entrances are provided for certain rooms, they should lead thereto as directly as possible, with only suitable vestibules and lounges in which visitors may wait for friends and from which cloakrooms may be approached. Service entrances should be as far from guest entrances as possible and, when the site permits, they should be in different streets. They should be placed near the departments which they are to serve and should have space in which vehicles may stand while unloading without disturbing the general traffic on the road. It should be borne in mind that goods entrances tend to be noisy and every effort should be made to prevent such noises disturbing guests in rooms above.

The actual size and number of doors in each entrance must be dictated by the requirements of each individual scheme, but it is wise to err on the generous side in order to be sure that there will be no congestion. Whenever the local bye-laws permit, marquises should be placed across the pavement, to the width permitted, at all entrance doors; these marquises are not only useful in wet weather but also mark clearly the position of the entrances for approaching vehicles. It is customary and advisable to install revolving doors at guest entrances to reduce draughts and cold, but when they are used, ordinary swing doors should be provided in addition on one or both sides for use during rush periods. The actual doors must be set back from the frontage line to accommodate the outward swing as they should always swing both ways, but this set-back is also desirable as a pause between the doors and the pavement. Figure 5 illustrates two typical main entrances to hotels, together with luggage entrances; in each example the main doors are set back to form an external lobby and the luggage entrances are placed on the frontage line. A marquise covers each entrance and extends over the side at a slightly lower level to cover the luggage entrance. Example B shows the provision of a small office for the door porter on one side and a parcel receiving office on the other side, communicating with the luggage

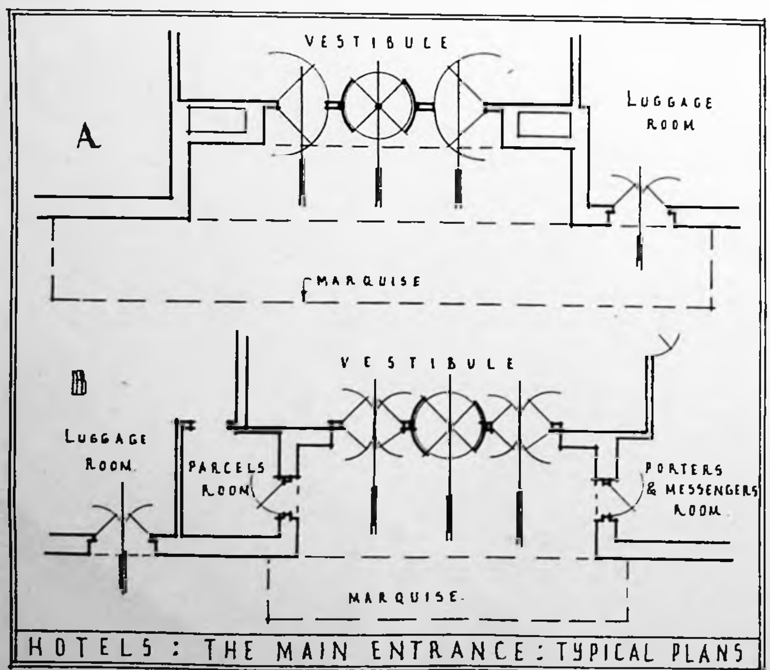

Figure 5

reception room which has a separate entrance from the street. The luggage entrance cannot have steps at the approach as barrows have to be used to move the heavier baggage ; the luggage doors should be about 5 ft wide in the clear. Revolving doors, when used, should be at least 6 ft in diameter. The service entrances will be discussed in greater detail later in this section, as part of the service accommodation of the hotel.

Entrance Hall—The main entrance hall is the centre upon which the whole working of the hotel turns, so far as the guest is concerned. Efficiency in the planning of the entrance goes a long way towards making an hotel successful, as the quickness and ease of service given to the guest at this point often have considerable effect upon him, while congestion creates a very bad impression. Figure 6 shows a general analysis of the various circulations of guests in the main entrance hall. This hall is generally a lounge, adjoining which are the various offices or counters dealing with enquiries, rooms, letters and cash. There may also be shops or selling counters round part of the entrance hall. In some hotels this entrance hall is kept small and cut off from the general lounge but in others it is only part of a large lounge placed at one side or end, and not even separated by screens. The guest, on entering the hotel, wishes to go as quickly as possible to his bedroom where he leaves his property. Before going to his room it is necessary to register and obtain a room key ; the circulation, therefore, should link the entrance to the lifts, passing the necessary registration and key desks on the way. These various desks or counters should be placed where they may be quickly seen by the guest on entering and should have ample length in proportion to the number of guests ; they should be so placed that persons waiting do not disturb circulation in the hall, and so that those standing at the counters are not disturbed by passers-by. All the counters dealing with guests and their rooms should be grouped together and should only be sections of one long counter, except for the hall porter's desk. The front entrance hall should give direct access to the main lounge from which the other public rooms may be approached, while corridor connections should lead to other rooms, such as the grill and ball-rooms. Cloakrooms should be accessible from the main entrance hall. The lifts and main staircase serving the bedroom floors should be placed so that they discharge into this main hall, but they should be placed to one side and not in such a position that they disturb the main ground floor circulation, as many people enter the hotel, while only guests have to use the lifts or stairs. It is better if lifts, which are the main means of vertical circulation, are easily visible from the enquiry

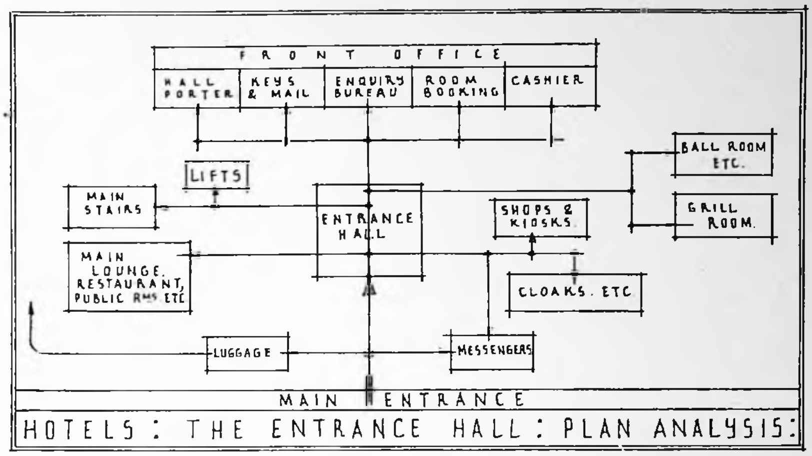

Figure 6

and key desks, while the staircase, which needs less control than a lift (which has an attendant), should be so placed that the porter can have visual control from his desk to prevent persons, other than guests, having access to bedroom floors. As the staircase, except in hotels having few floors, is no longer used to any large extent, unless it also gives access to public rooms on a mezzanine or the first floor, it need not have a prominent position on the ground floor, but on upper floors it is advantageous to group the lifts and main staircase together to form a main approach to each floor of bedrooms.

Most hotels have at least one shop or kiosk in the entrance hall at which newspapers, tobacco and confectionery are sold, and in large hotels these become of great importance and are very valuable revenue assets, whether operated by the hotel or leased as concessions. Also in larger hotels it is general to have hairdressing saloons, which, however, do not as a general rule affect the planning of the main entrance hall as they may be placed in basements or on a mezzanine or first floor.

Vertical Circulation — Efficient organisation of the vertical circulation is of the utmost importance in ensuring economy in operation and convenience to guests. The lifts are far more important than the staircases, both for the guests and for service purposes and should therefore have primary consideration. The guests' staircases, except in buildings having two or three stories only, are little used unless certain of the public rooms are on the first floor, in a mezzanine or on basement level. The service staircases are used for staff circulation ; maids use them when passing from one floor to that immediately above or below, but not, as a general rule, when several floors have to be passed. Some hotels, however, do not permit the lifts to be used by maids or bedroom floor staffs, but only for general access and by the porters, messengers, etc., who may be actually serving guests at any given moment. These service staircases also serve as escape staircases for the guests, and should therefore be so placed as to serve this purpose in accordance with fire regulations. Figure 7 illustrates the main vertical circulations and the floors which each staircase or lift normally has to serve. The main staircase should serve all floors to which guests require access ; its position may, however, be slightly moved at first-floor level, as it is at this level that the typical floor plan commences, whereas on the ground floor its position may need to be changed slightly in order not to interrupt main circulation on that floor and also so as to place the lowest flight in good relation to the general lay-out of the main entrance hall. This main staircase need not be continued to basement level unless important rooms for guests' use, such as grill rooms or ball-rooms, are situated at that level ; a subsidiary staircase is sufficient for access to rooms of lesser importance, such as the barber's shop. Main service staircases must connect all floors, since they also act as escapes, but their positions may be slightly changed above and below the street level. They must give access to the street in some way if they are to be used for fire purposes, and must be properly cut off in the usual manner. Additional staircases may also be needed for staff access to basements from the street level at staff and goods entrances, to boiler-rooms and to workshops ; also direct staircases connecting kitchens to restaurants and banqueting rooms. The latter should serve only their own particular purpose, to avoid interference and congestion of food service. The lifts are also separated into groups for each special function. Lifts for guests should serve all floors and should in no circumstances be used for transport of goods, staff or luggage, except in very small hotels or those in very low-price grades. In addition to the main lift service for guests, some large hotels which have an important catering section for the use of casual visitors (not guests), find it necessary to provide lifts connecting the entrance floor to special suites

or rooms, such as restaurants or banqueting rooms, which may only have a travel of one or two floor heights. The main service lifts have the transport of guests' luggage as their chief function and are also concerned with the transport of supplies, such as linen, from the stores to the various floors. In all hotels of the higher-priced grades there should be direct connection between the kitchen and the food service rooms on each floor. These lifts should, if possible, serve no other purpose, this being, however, a matter which will be discussed in greater detail later in this section. There may also be lifts, dumb-waiters, or continuous conveyors connecting the restaurants to the kitchen if these are on different floors; if these are required, they should connect these rooms only and serve no other purpose. Lifts or hoists may be required at fuel and goods entrances to convey goods from street or entrance level to basements or sub-basements. There are certain other appliances of vertical circulation which are essentially matters of epuipment for special purposes and also are only in use in a limited number of hotels, mainly large ones, but not necessarily of the higher-price grades. The equipment may consist of chutes for soiled linen from all floors to the dirty linen store and for rubbish and waste paper to a collection and disposal room. Both these installations save much work for the staff, and also help to reduce congestion on service lifts which otherwise have to handle rubbish or linen containers.

Figure 8 illustrates the factors governing the positions of staircases in three typical hotel plans. In all districts an alternative means of escape should be provided to every bedroom. Diagram A shows a plan shape in which the main staircase is placed as centrally as possible, so as to serve the whole of the floor area, with two secondary or service staircases at the ends of each wing. The bye-laws of many districts do not permit the distance between any room door and a staircase to exceed 80 ft, thus limiting the corridor length between two staircases to 160 ft in a plan such as this.

Type B is based on the assumption that rooms may be placed up to 80 ft from a staircase, in which case two staircases, one main and one secondary, serve the entire building. This plan arrangement has a fault in that the main staircase, which the main lifts would probably adjoin, is so placed that many guests have a long walk to their rooms; this is avoided by the placing of the main staircase in the way adopted in Type A. Type C is also based on one main staircase and one secondary staircase; this gives a very economical lay-out and also one which is very convenient in working. Any plan shape based on a cross with wings radiating from a central staircase and lift hall needs an additional staircase for escape at the end of each wing. This may not appear very economical, but is usually offset by the advantages gained in other ways, such as the elimination of light courts.

Main staircases do not need to be of any special dimensions, but they should be wide and easy-going, with continuous handrails on both sides from floor to floor. Service staircases need only be of the widths dictated by local bye-laws to comply with fire regulations; these are usually cut off at the various floor levels in such a way that their appearance and finish is of little importance and the materials must therefore be selected to withstand the very hard wear to which they are usually subjected, without undue first cost. The main staircase generally has to have a good architectural appearance, especially if used to connect floors in which there are public rooms, and the materials and design should therefore be considered mainly from the point of view of effect rather than resistance to hard wear. All main staircases should be covered with carpet to ensure quietness as well as good appearance.

Lifts are of the utmost importance, even in small hotels and low-price grade hotels. The tendency is for guests to give up using staircases almost entirely as a means of vertical circulation. Many hotels cause considerable inconvenience and annoyance to their guests by having a badly organised or insufficient lift service. Whenever possible at least two lifts should always be installed to handle rush demands properly and also to guard against possible breakdowns, as guests in hotels usually include some persons too old or too infirm to walk up several floors. Passenger lifts are better in the form of a battery of small, fast-running lifts rather than one or two large cars, the only drawback being that additional staff is needed to take charge of each car, as few hotels have, up to now, adopted the push-button type operated by the passenger. It is desirable to install a minimum of two passenger lifts, and

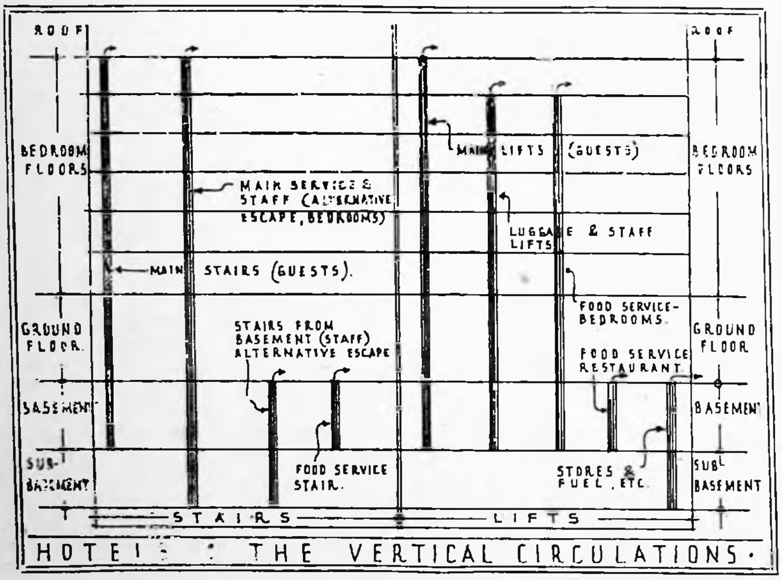

Figure 7

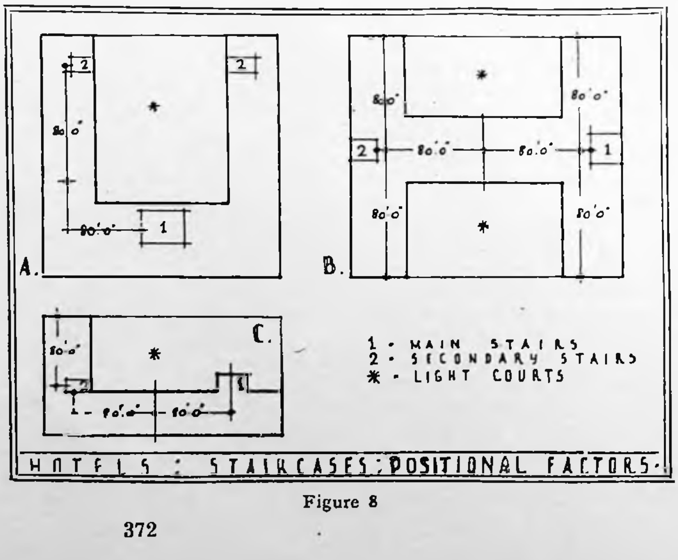

Figure 8

these should be sufficient to take care of 200 bedrooms, unless the plan is very spread out, when it may be necessary to have an additional lift placed away from the main lift battery and main staircase. A ratio of one lift for every hundred bedrooms is desirable.

Service lifts should be provided at the rate of two for every three passenger lifts, exclusive of any lifts devoted to food service to bedroom floors. Service lifts must be designed to carry heavy loads, as luggage and goods for store rooms are often of very considerable weights. Freight lifts must be designed of sufficient size, as they have to be used for the transport of bulky articles, such as wardrobes, box-spring mattresses and loaded luggage trolleys.

It is essential to plan ample space in front of all passenger-lift doors, so that waiting passengers may stand without disturbing the main circulation of the adjoining corridors. It is an advantage to have the main staircase and main passenger lifts on two sides of a single lobby, which should be very much wider than the normal corridor width. Figure 9 illustrates a typical lift lobby lay-out on a bedroom floor ; the two passenger lifts are on one side with the main staircase opposite ; the lobby is formed by increasing the corridor width, especially on the lift side, to provide ample waiting space. This is obviously not so necessary for the staircase. The figure also shows clearly several other important points. The main luggage lift is placed behind the passenger lifts, thus grouping all the lift machinery and wells together, which is usually an economical and efficient arrangement. The luggage lift discharges into a luggage room which is fairly centrally placed if the main lifts are in the central position they should occupy. A further point is the isolation of the lifts from bedrooms by the luggage and service rooms ; lifts may be noisy and spoil the letting value of any room which adjoins a lift shaft.

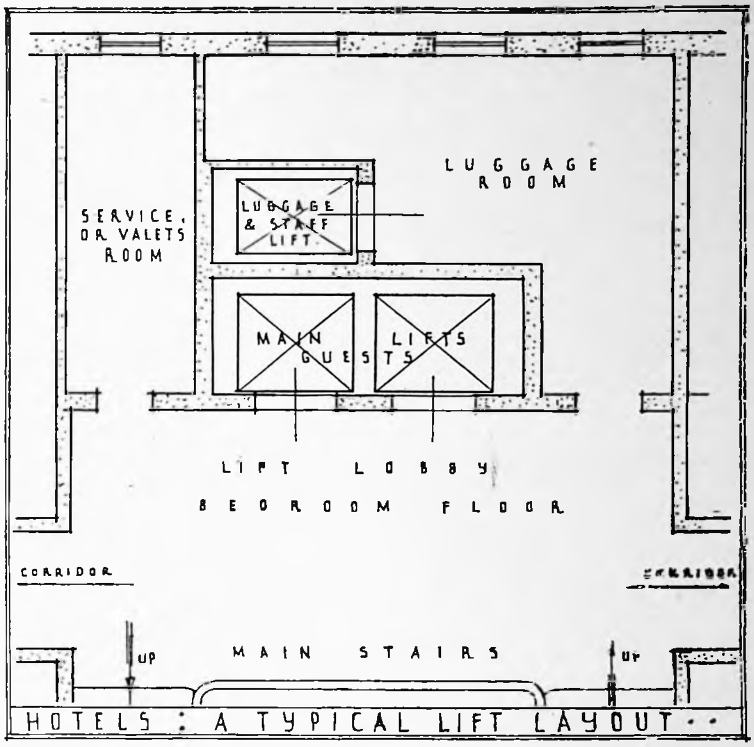

Figure 9

Typical Bedroom Floor Plan—The main plan shapes have already been discussed to some extent, the essential factors being to obtain the maximum number of rooms per floor, having due regard to natural light and air, especially that provided by windows not overlooking light wells or internal areas of any kind. The actual planning is mainly dependent on the typical bedroom unit or units to be provided on each side of the main communicating corridors. The bedroom plan must be considered as the most important matter to be settled after the main vertical circulations have been agreed. Adjustments to floors beneath the bedroom floors can generally be made to accommodate the shape and positions of staircases and lifts and main service lines, so that the most economical bedroom floor plan may be used. The lower floor plan units are larger and more adaptable in the plan than the typical bedroom unit.

The typical bedroom floor plan has to provide space for the bedrooms themselves, sitting-rooms, bathrooms, W.C.s and the various service rooms, such as linen stores, maids', valets' and waiters' rooms ; these are generally arranged within one or two of the standardised units from which the typical floor plan is built up. Special units, or the use of two normal units, may have to be used for suites. The best aspects and prospects must be given to the bedrooms in preference to service rooms, bathrooms and staircases ; in lay-outs for schemes such as those for seaside positions, the bedrooms should be concentrated on the elevations which have the view of the sea and all other less important rooms should be concentrated, as far as is practicable, on the elevations having no sea-view prospect. Suites are generally most easily placed at the ends of wings or in corners of floor plans where they do not interrupt the steel grid plans which are based on the repetition of the standard or normal bedroom unit.

The bedroom units also have to include bathrooms, if these are to be planned in conjunction with each room or pair of rooms and in all better-class hotels the " bathroom to every bedroom " is a growing demand which is having to be met in new hotels or the rebuilding of older ones. It is, therefore, very difficult to discuss fully the bedroom without continual reference to bathrooms ; as the introduction of internal and artificially ventilated bathrooms is now often allowed by the bye-laws in this country, it is necessary to discuss this aspect of the typical bedroom lay-out a little, before considering in full detail the bedroom. Opinions vary very much as to the desirability of internal bathrooms, but there is no doubt that very great saving in space may usually be effected by their use and also more bedrooms can be obtained in a given length of frontage. For hotels where large numbers of bathrooms are required especially attached to individual bedrooms, the introduction of internal bathrooms should be very seriously considered, except in very high-priced hotels and possibly those in selected positions, such as at the seaside and where site area and value does not affect the scheme to any great extent, when externally placed bathrooms are probably to be preferred. There seems little doubt that artificial ventilation is the most satisfactory method to guarantee adequate and continuous ventilation of bathrooms, as there is no certainty that windows, when provided, will be kept open ; also artificial ventilation extracts the air from the bedroom through the bathroom where it collects steam, and passes into a duct, whereas in external bathrooms the open windows tend to blow foul air and steam into the bedrooms, unless doors and lobbies are well arranged. The provision of a bathroom to every bedroom in all better grades of hotels does not always prove to be as expensive as may first appear, owing to the reduction of staff work due to the elimination of such duties as carrying water, emptying " slops," apart altogether from the convenience and privacy given to

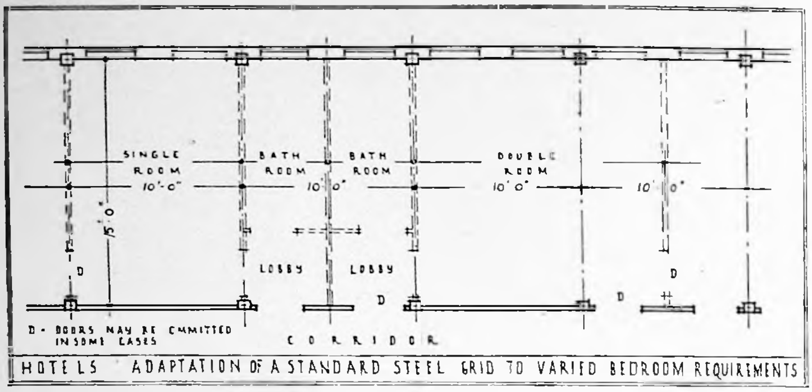

Figure 10

guests by the provision of private bathrooms. The provision of a lavatory basin in all bedrooms does much towards the saving in staff work, even if the expense of providing baths and W.C.s attached to each bedroom is considered too great, but it is not nearly so satisfactory from the point of view of the guest.

Bedrooms—There has been a great tendency in recent years to reduce bedroom sizes, even beyond the sizes really necessary for comfort and to accommodate the essential furniture. The increase in use of built-in furniture and fitments instead of loose furniture has helped to make possible this reduction in floor area. A number of hotels now work on the principle of making nearly all rooms large enough to be used as a double bedroom ; the double bed is rapidly dying out in favour of two single beds, which has considerably influenced bedroom planning. These two points are of very great importance and should be borne in mind early in the planning. The extra space required for a two-bed room is very small compared to that needed for two single-bed rooms and often two friends will share a two-bed room who would not share a double bed, and the total number of guests who can be accommodated in times of pressure is thus increased.

Bathrooms, if not planned as part of the bedroom unit as is necessary if they are definitely attached to one or two rooms, may be grouped together in easily accessible places on each floor plan or may be placed so that one or two bathrooms serve a group of rooms. If bathrooms are not attached to particular rooms or groups not exceeding two bedrooms, the W.C.s should always be separated. Bathrooms and their relation to bedrooms are discussed in greater detail later in conjunction with bedroom units and as separate apartments.

Bedroom Sizes—The smallest desirable hotel bedroom is 12 ft by 8 ft, or 96 sq. ft. ; this is, however, only suitable for single rooms in the lowest-price grades and for general purposes the smallest room should be about 9 by 15 ft, in which it is possible to place a double bed or two single beds, but only with very cramped space. Good sizes for double bedrooms are as follows : Good second-class hotel, 11 ft by 15 ft = 165 sq. ft. ; ordinary first-class hotel, 12 ft by 18 ft 6 in = 222 sq. ft. ; good first-class hotel, 14 ft by 18 ft 6 in = 259 sq. ft.

Opinions as to room sizes do, however, vary enormously among hotel managers, but the basic sizes must be mainly dependent on the furniture to be put in the rooms, which is fairly constant in relation to each price grade. The important factor is to design bedroom units which produce a simple steel grid so that single and double rooms may be fitted together to fill the same stanchion spacing. Figure 10 illustrates a steel grid which allows various arrangements of rooms retaining a steel bay width of 10 ft. The 10 ft width is used for a single bedroom, for two bathrooms and two entrance lobbies and three similar bays for two double bedrooms. The positions of the partitions are adjustable inside the steel plan, thus making up any arrangement desired. Similar methods may be worked out for varying sizes of units.

Figure 11 illustrates the comparative areas occupied by bedroom and bathroom units where the bedrooms are of the same area, 120 sq. ft., the bathroom being placed internally in Type A and externally in Type B. Type A requires 12 ft frontage per room and Type B 15 ft 6 in frontage. The depth required from the outside wall to the centre line of the corridor of a wing is 21 ft 8 in for Type A and 16 ft 5 in for Type B. The approximate total areas required are very little different, being 260 sq. ft. in Type A and 254 sq. ft. in Type B, or 270 sq. ft. in Type C, which has a wider bathroom than Type B. The important factor is, however, that Type A gives slightly over 8 units per 100 ft of frontage, against about $6\frac{1}{2}$ units in Type B, which affects many schemes very considerably, although in the internal bathroom type the extra cost of artificial ventilation is also involved. By the elimination of the cupboards in the entrance lobbies to the bedrooms and by turning the rooms so that the longest dimension is at right angles to the window wall, as shown in Figure 12, Type B, there is a still further gain in frontage. The advantage of the bathroom in Type C over that shown in Type B in Figure 11 is that the fittings may be arranged better and the pipe duct placed on the external wall, which presents fewer difficulties below the lowest bedroom floor where pipes have to pass through main public rooms without interfering with the lay-out of the latter. Bathrooms are frequently built with the ceiling height at a lower level than the adjoining bedrooms in order to conceal the plumbing as much as possible and by having loose panels

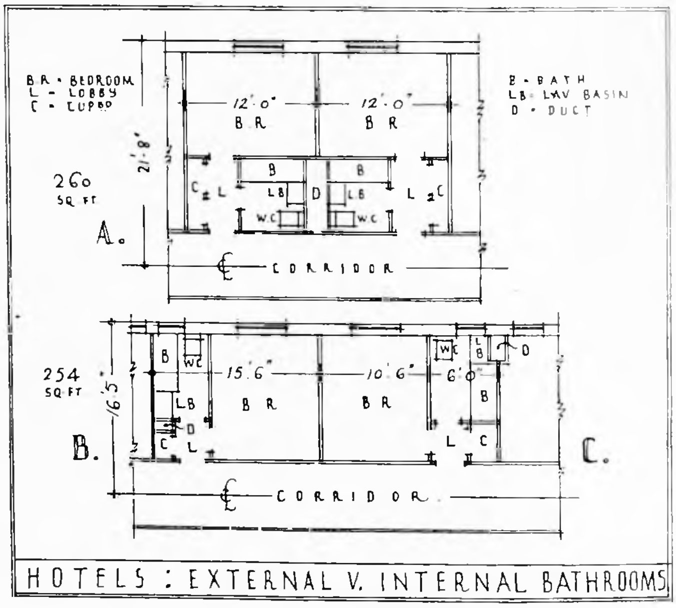

Figure 11

in the ceilings the suspended plumbing may be made easily accessible.

So far the bedroom with the external bathroom has been the main consideration and it is now proposed to discuss the plan types involving internal bathrooms having artificial ventilation. Figure 12 illustrates the two most usual plan arrangements, of which Type B is more generally adopted in congested sites to economise frontage. Type A has one external and one internal bathroom placed on each side of a pipe duct ; both these rooms are approached directly from the bedrooms, which do not have entrance lobbies from the corridors. Type A also tends to make the room somewhat congested when the furniture is in position, due to the loss of part of one of the main walls for the bathroom door. Type B has both bathrooms placed internally adjoining the corridor ; these bathrooms are entered from a cut-off lobby acting as a noise and ventilation buffer between the bedroom and the bathroom and corridor. As the bedroom and corridor doors are opposite each other the passageway may be reduced somewhat, leaving space for two cupboards side by side, one for the use of each of two adjoining rooms. In the larger-sized rooms of Type B it is quite usual to place a continuous fitment of shelves, trays, and hanging space the full length of the wall separating the room from the bathroom, in which case the beds are placed with their heads to the side wall parallel to the window wall and out of the draught between the windows and the door ; but in smaller rooms of this type the bed-head is usually placed against the wall dividing the bedroom and bathrooms. These two lay-outs of beds appear, in practice, to provide the most spacious arrangement of furniture.

Figure 13 illustrates bedroom and bathroom units of a more elaborate character incorporating a dressing-room ; units such as these are only applicable to hotels of the luxury class or to a few suites in high-grade hotels. The two types shown have practically the same accommodation, but in Type A the bathroom is placed externally and the dressing-room internally, whereas in Type B the positions are reversed in order to provide daylight in the dressing-room ; the latter is, in all probability, the most desirable arrangement. Hotels such as would require units of this type would need bedrooms about 18 ft by 12 ft 6 in, there being plenty of space in this length for both the bathroom and a small dressing-room. Type B also has the advantage that the dressing-room not only has daylight but also acts as a cut-off between the bathroom and the bedroom, and in addition, as the bathroom is artificially ventilated, the air is extracted through the dressing-room, thus eliminating the risk of steam being blown by an open window into the dressing-room and ultimately into the bedroom as might happen in Type A. The dressing-room, if considered to be too small, may be increased in area by throwing the entrance lobby into the area occupied by the bathroom and dressing-room and by approaching the room directly from the corridor, although this is not particularly desirable in hotel suites of this class.

The equipment of bedrooms varies very considerably according to the hotel charges. It is general in all hotels, except the very cheapest grades, to provide central heating in all bedrooms ; the only other exceptions being hotels at seaside or in similar situations, if they are only to be occupied in the summer months ; but even in these, unless the season is very short, central heating is often a desirable feature and in addition has its usefulness in keeping the building in good condition during the months when it is closed. The radiators in each room must be controllable by the individual guest, as temperature requirements vary so much ; it is also important that the heating surfaces should be such that changes of temperature are obtainable very rapidly.

The provision of lavatory basins in all bedrooms, even those with bathrooms attached, has become general in all grades of hotels, not only for the obvious convenience to guests but also because of the great saving in labour caused by the elimination of the carrying of hot water and the removal of " slops."

An adequate number of lighting points is required, properly placed and switched in relation to the dressing-table, lavatory basin, and bed-head, as well as for the general lighting of the room, in the better grades of hotels and in all classes at least two lights are desirable, one to light the room, more particularly the dressing-table and shaving mirror and the other for the bed, the latter being controlled from the bed.

Heating, in addition to the central

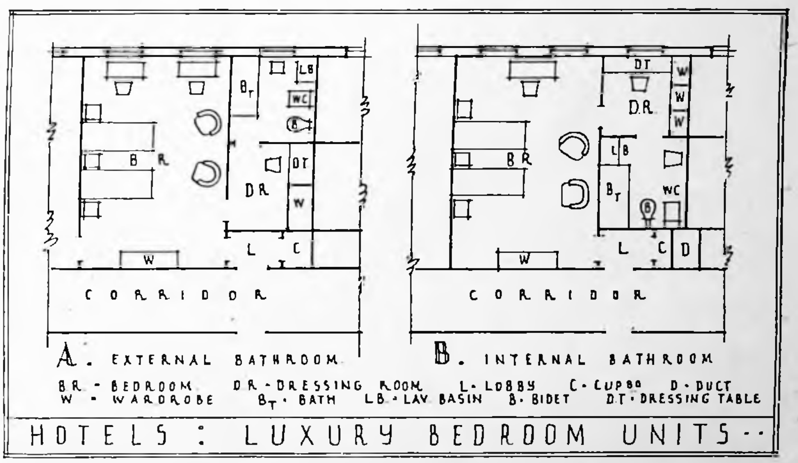

Figure 13

heating, is essential in sitting-rooms, and in bedrooms of all better-grade hotels. When subsidiary heating is provided or heating is required for bedrooms of lower-priced hotels without central heating, gas or electric fires are generally installed with coin slot meters attached so that the guests pay for their own fuel consumption without it appearing on the bill and, moreover, only pay for fuel while they are in the room, an advantage which is not possible with coal fires.

Coal fires are, however, installed in many sitting-rooms but provision must also be made for gas or electricity.

The remainder of the equipment of the bedrooms may be more strictly termed furnishing, but, as much of

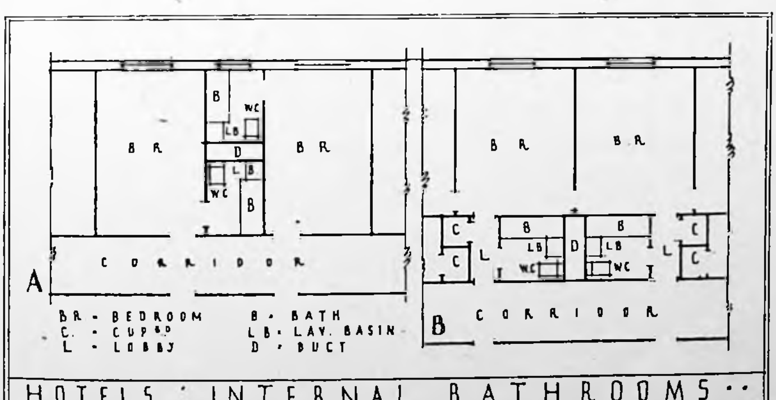

Figure 12

this is now built in as fixtures, it becomes essentially part of the building. The built-in fitments vary very considerably in number, type and size, excepting only the wardrobe cupboard, which is becoming a fitment in most hotels, although these are of suitable sizes and fitted more or less elaborately according to the grade of hotel ; the wardrobes in small hotels are small, simple, and cheaply produced, but in other grades they have become large and very elaborate pieces of equipment. The other furniture, which is sometimes built-in, comprises dressing-tables, bed-head fitments, window seats, curtain boxes.

In the higher grades of hotels close carpeting of floors has become a general practice, which eliminates all forms of floor finishes, since the carpets are laid on thick felt placed directly on to a fairly smooth screed over the structural floor. Cheaper-grade hotels, however, do not appear to be able to bear the cost of close-carpeted floors and therefore use polished floors and one or two small rugs ; but the cost seems to be very similar if moderately good flooring timbers are used. An alternative to carpet is linoleum laid on concrete but this is both hard and cold.

Bathroom equipment usually consists of the bath, a basin, towel rail, and a W.C., and in most higher-grade hotels the bidet is becoming a usual fitting. Shower-baths are not often provided as separate fittings in this country, but many baths in better-class hotels have a shower placed over them. The shower-bath only with a basin and W.C. is fairly common in American hotel rooms of the commercial and lower grades ; the installation of such bathrooms shows a saving in space over those with tub baths, but little saving in upkeep, especially in regard to consumption of hot water.

Corridors—The corridors on bedroom floors are usually 7 ft 6 in wide for main corridors and 6 ft wide for secondary ones. It is the general practice to carpet part or the whole of bedroom corridor floors and the widths should be governed by the normal commercial widths of carpets. When uncarpeted borders are used, these may be of wood, terrazzo or marble, of such thicknesses as to be level with the carpet in the central part, as the latter is generally laid directly on the screeding with a thick underfelt. In some hotels the borders are used as covers to pipe and wiring ducts, an arrangement giving great ease of access ; the covers are laid in short lengths, and fixed into place with screws for quick removal. Frequently corridors are not made the full height of the bedrooms in order to provide continuous duct spaces for the various services, such as electricity, telephones, ventilation, etc. Many hotels have a fanlight fixed over every bedroom door in order to assist the ventilation of the corridors and rooms, and more particularly to ventilate bedroom entrance lobbies, which are sometimes entirely enclosed ; fanlights have the disadvantage, however, of permitting noise from the corridors to penetrate to the rooms, more especially when entrance lobbies to bedrooms are not used or fanlights are placed over both the bedroom and the corridor doors in the same entrance lobby.

Service Rooms— Every bedroom floor should be equipped with one or more of each of the following rooms according to the number of bedrooms on each floor :—Linen store, furniture store, maids' store and slop-sink, and in better-grade hotels a food service room and valets' room. The bedroom linen stores are supplied from the main linen rooms, generally in the basement, from day to day according to the number of guests vacating rooms. These linen stores are frequently entirely artificially lighted, and may thus be placed in the odd dark corners of the typical floor plan. They should be ventilated and heated to ensure dryness ; their size should generally be not less than 5 ft by 4 ft and they should be fitted with slatted shelves deep enough to carry folded sheets, towels and blankets, necessitating a shelf depth of at least 24 in.

Figure 14 demonstrates the essential data for linen rooms. Shelves are best confined to one or two sides and not placed on a third side, such as the end wall opposite the door (see Figure 14) as the loss of space on side shelves is not offset by the gain on the extra short shelf length by reason of the corners becoming useless. The minimum useful linen room is shown by the dotted line on the plan, but in this case the door must open outwards. The shelves are arranged so that on one wall are deep shelves for large articles, such as sheets, blankets and quilts, and on the other wall are shallower shelves for smaller articles, such as towels and pillow cases. The lowest shelf should be raised at least 3 in above the floor for sweeping purposes ; the most useful space is that between 2 ft and 6 ft above the floor, and this should be used for the articles in everyday use, while the lowest level and upper part, which are more difficult to reach, may be used for storage of mattresses, mattress covers, pillows and spare blankets, access to which will only be required intermittently.

It is more satisfactory to store linen in a separate apartment than in a cupboard in a room used for other purposes, such as the sink room (unless the maids share the valets' service room), owing to the likelihood of steam from hot taps penetrating to the linen. It is essential that there should be one room in which the floor maid on duty can sit with reasonable comfort, and it should be a room with adequate daylight and ventilation. In some hotels, where food service on bedroom floors is unimportant, except perhaps as regards early morning tea and breakfast, the maids sometimes use the service room, while the slop pantry is artificially ventilated, and used only for its own purposes and the storage of the maids' supplies ; in other hotels of the lower price grades the maids' pantry, store and food service room are combined. In the better-class hotels the maids' pantry and store may be combined or separate, but the maid on duty uses the pantry, which is made rather larger than the minimum required for the slop-sink, storage of service trolley, etc. One or two hotels do not allow their maids, when on duty, to sit in the pantry, but provide a chair in the main corridor, near which are

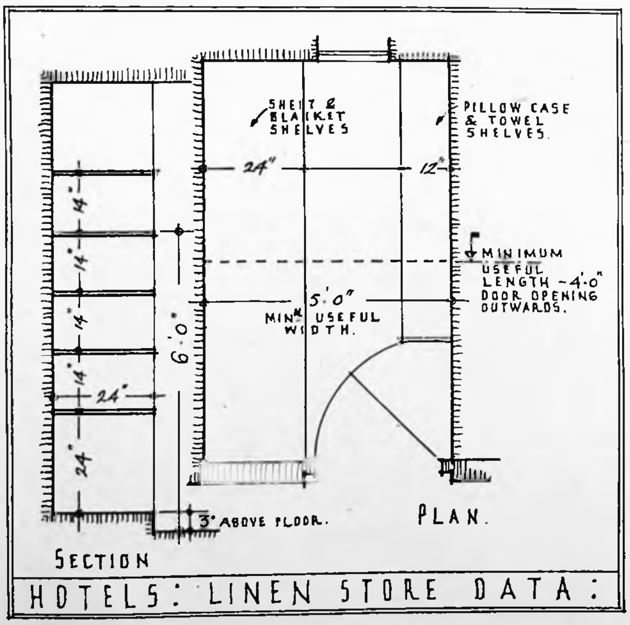

Figure 14

placed the bells or call signal boards; this arrangement permits of the use of minimum sized pantries, artificially lighted and ventilated, and also it ensures that the maid sees everybody and everything that passes along her corridor. The pantries should have the fittings well placed, together with adequate shelves and containers for stores, such as dusters, soap, brushes, cleaning materials, china, etc., if she serves early morning tea, as the maid often does from her own pantry, independent of the main kitchen.

Dirty linen is collected into the bedroom floor linen stores in some hotels, and removed when the new supplies are brought up, while others have collecting baskets, which occupy considerable floor area, placed in the pantry. The most satisfactory method of dealing with soiled linen seems to be the installation of chutes connecting directly to a dirty linen sorting room in the basement; by this method the linen is not stored on the floors, thus saving space and providing a more sanitary arrangement; it also permits sorting to take place at any time during the day instead of at one rush-time when baskets would be collected from all floors at one or more stated periods of the day. A further reason in favour of the installation of chutes is the elimination of work for the lifts. Many hotels, especially those of the luxury class, require a room on each floor in which to store extra furniture; some guests may want extra tables and chairs, a double bed instead of twin beds, a child's cot, and so on. Such a room should have clear floor space, excepting that one tier of stout shelving, fixed about 3 ft above the floor, may be placed along one wall to receive smaller articles, such as bedside tables and small chairs, in order to make the maximum use of floor space. Mattresses are sometimes stored in the furniture store room, but are better placed in linen rooms, where they are usually better heated and looked after.

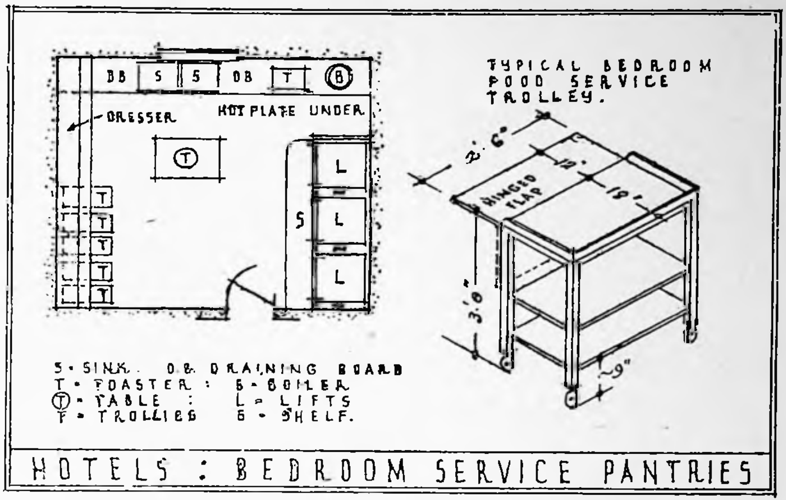

Figure 15

Food Service — The amount of food service required on bedroom floors varies very greatly; in the cheaper grades it amounts only to the service of early morning tea and occasional breakfasts, in the middle grades rather more breakfasts are served and also afternoon teas; whereas in luxury hotels, which have some sitting-rooms on each floor, many meals are taken in rooms, and complete and elaborate lunches and dinners have to be served.

There are two main methods of serving food in bedrooms: first, by means of service rooms on each or alternate floors connected to the kitchens by means of lifts, and, secondly, by serving directly from the kitchen, a waiter bringing a prepared trolley by means of the service lift from the kitchen to the bedroom or sitting-room. All methods seem to be the cause of equally large numbers of complaints from guests as to the state of the food on arrival. The difficulty of having the service room on each floor is that two persons are necessary to produce a satisfactory service, one to take orders, pass them on to the kitchen and receive and empty the lift from the kitchen, and the other serving in the rooms; in the "direct from the kitchen" method, the person who receives the orders receives them, not from the waiters, but by telephone from the guest; the amount of labour needed is thus diminished. On the other hand, there is apt to be confusion among the waiters leaving the kitchen who jostle for turns at the lifts, unless there are several lifts available; this method does, however, appear to produce more rapid service and probably conveys the food in a better state.

In the cheaper type of hotel a waiters' room is generally unnecessary so long as there is lift connection to the kitchen level from the maids' pantry; in the middle priced group a small service room, at least on alternate floors, is required, while the higher priced and luxury groups require a large and well-equipped service kitchen on every bedroom floor.

Service rooms must provide a sink, draining-board, facilities for boiling water for tea and coffee, making toast and cutting bread and butter. China and silver are, in many hotels, kept on the floors on which they are used, therefore china storage cupboards and washing and cleaning facilities are essential, unless direct service from the kitchen is provided.

Main Lounge—This may be provided either in the form of a corridor room from which other public rooms are approached, or as a room completely cut off. The first type seems to be growing more general in those hotels in which the guests do not stay for long periods, while the second type is more usual in residential and resort hotels. In both types there are, of course, other public rooms which are always planned as separate rooms. The large general lounge, of the first type, may be of any shape, but should not be so long and narrow as to assume the nature of a rather wide corridor, this shape being very difficult to furnish in a comfortable way. Lounges in luxury hotels are little used by the hotel guests, as there are usually many private sitting-rooms and in this type the lounge becomes a general meeting place, mainly for the use of casual visitors, especially at tea-time; it is also used as an ante-room to the restaurant at lunch and dinner times. In residential and resort hotels the guests use the main lounge much more as a common meeting ground; it should, therefore, have a larger area in relation to the number of guests than the lounge of an hotel used mainly by transient guests. The figures illustrate the various types of plan by means of actual examples of hotel plans; in addition to these there is the very common American type which provides one rather vast space called "the lobby," which is the central circulation space around which are placed the office, lifts and public rooms; it is usually two stories in height, the upper floor forming a gallery round a large well, this gallery being reserved as a lounge and a writing place for the use of guests sleeping at the hotel. This two-storied "lobby" of the American plan is often the only public space other than restaurants. The plans illustrated show the chief differences of idea in the planning of main lounges. Figure 16 illustrates the plan of the Dorchester Hotel, London, in which the lounge is virtually a long but wide corridor from which all the main rooms, such as the grill room, restaurant and ballroom are approached; it is broken up into sections by columns forming part of the decoration, and doors are provided leading directly to service

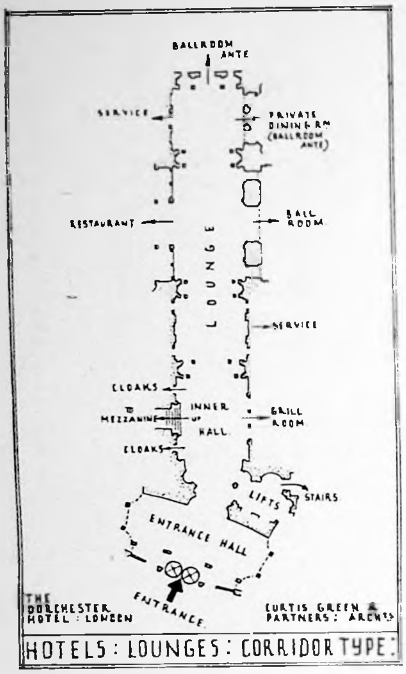

Figure 16

units so that adequate waiter service is provided to all sections, even when a section is closed off to serve as an ante-room, as for example, to the private dining-room. In a luxury hotel of the Dorchester type, the main lounge serves chiefly as ante-room to the two restaurants and ball-room where guests or visitors may wait and, if desired, drink before meals. It should be noted that part of this lounge, the inner hall, gives access to cloakrooms and to the mezzanine floor of public rooms.

Figure 17 shows the Gresham Hotel, Dublin, which is a different type, in which the main lounge—the winter garden lounge—is again an access room serving the restaurant, breakfast room and ball-room, but is more definitely a room or open space as opposed to the corridor type in Figure 16. It becomes more of the nature of a lounge and less of the restaurant ante-room than is the case with the corridor type. This central or internal type is frequently top-lighted from a lighting area above. It should also be noted that the approach from the entrance hall to the lounge is down a few steps; such a change in level usually assists greatly in the general effect, especially if the main room is at the lower level; it is also of practical assistance for guests trying to pick out friends who may be seated in the room.

Both of the plans shown in Figures 16 and 17 illustrate happy arrangements of the entrance hall and its relation to the main lounge, and the entrance halls to the passenger lifts, main staircases and offices, which are well placed but at the same time sufficiently separated from the spaces used by the casual visitors or restaurant guests, to allow the latter direct access to the rooms they require without disturbing guests at the office counters.

Figure 18 is not taken from an existing hotel plan, but is typical of a very large number of hotels of all types, particularly of the seaside and semi-residential kind. The main lounge in this type is a very large room, or series of rooms, completely cut off from the corridors and entrance hall, and is therefore not in the nature of an access or passage room. Main lounges of this type usually have an open fire, introduced as a central feature of the decorative scheme, though it may be of no value from the

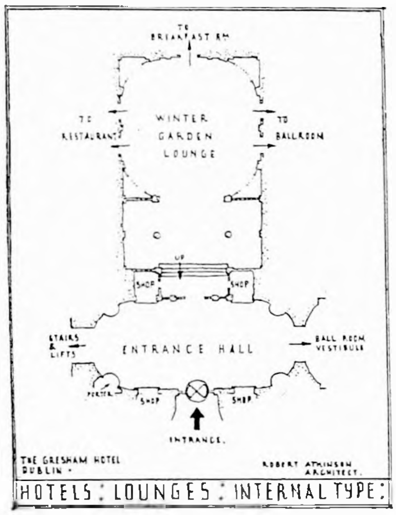

Figure 17

point of view of heating so large a room. The character of the decoration of main lounges of this type should be more or less domestic in character, whereas in the first two types the domestic atmosphere is less desirable. In seaside and country hotels good aspect and prospect are essential features for main lounges; direct access to gardens or terraces are not always so much appreciated as might be imagined, as they tend to make the rooms draughty and uncomfortable, particularly in rough weather at the seaside. Moreover, guests entering directly into rooms without passing through lobbies will create unnecessary and disturbing traffic through the room.

Commercial hotels always require a fairly large entrance lounge in which people can sit while waiting to see guests and in which they can meet and talk. The general lounge does not need to be so large as in the types already discussed. This type of hotel also needs especially large writing rooms and these may often be provided by reducing the separate lounge rooms.

A point of planning which has not been carried far in this country, although it has been increasing very much in some other countries, is the idea of placing most of the public rooms on the first floor, particularly in the case of city sites where the frontage at street level is of great value for shop purposes. The main objection is probably the very low total building height limit compared with American hotels, and to the difficulty of providing a sufficient number of bedrooms in a limited number of floors on the site. A plan of the first floor lounge type may have the main and secondary entrances only on street level, with shops on the rest of the street frontages, or at least on three of them. Alternatively the main frontage may be occupied by the shops and main hotel entrance and the rest of the site by a restaurant or grill room in general use by the outside public, together with secondary and service entrances. The main lounge in this type of plan often occupies a large part of the main frontage at first floor level.

It is impossible to give any definite information as to the necessary areas of lounges, but they should be as large as the conditions of the site will allow after providing the essential areas required for restaurants and service. Lounges are not, from the hotel keeper's point of view, very

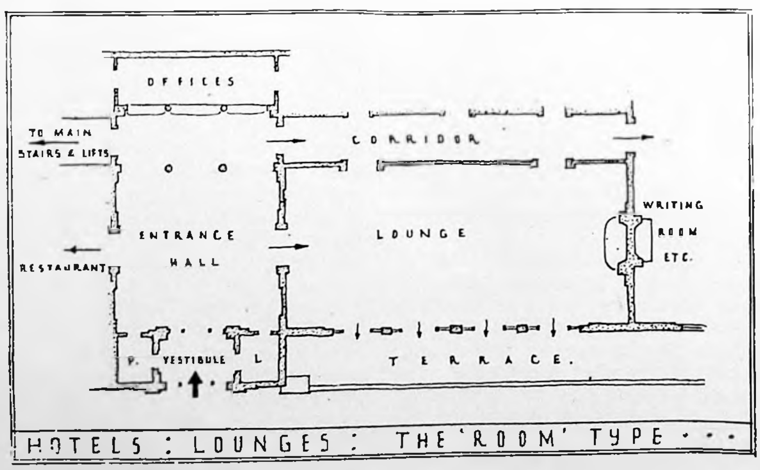

Figure 18

profitable, except when they are likely to be used to a considerable extent for the service of drinks, teas, etc. Some form of ante-room or lounge, having bar service, is essential (and generally profitable) and should be attached to all restaurants where meals are to be served to casual visitors, more particularly if there is a likelihood of creating a demand for cocktails; but in the hotels of the "quieter" types, especially in resort towns, many guests prefer the cocktail bar to be separated entirely from the main lounge and not have drinks served to any very large extent in the main lounge, which then becomes essentially the main sitting and reading room. It is not proposed to discuss in this section the merits of the service of alcohol in lounges as opposed to bars from the point of view of obtaining licences and meeting the whims and fancies of licensing benches, but it does seem that all good class hotels, other than definite temperance hotels, should provide for such service in lounges whenever possible, mainly for the benefit of women guests, many of whom are disinclined to enter the separate bar rooms. In commercial hotels a separate bar or bar lounge is very desirable, in addition to the main lounge. The furnishing of lounges should consist of a large number of really comfortable easy chairs and settees, and also plenty of tables, but in addition some ordinary armchairs are generally needed, especially if the room is used for the service of drinks and teas.

Drawing-rooms—A "drawing-room" is still provided in a number of hotels, particularly those of the quieter and more residential types; these rooms seem to have become mainly used by women guests as a quiet sitting-room, and in some hotels are even limited to their exclusive use. The size of the room depends mainly on the space available; its decorations and furnishing should be simple and comfortable. The need for such a room in a new hotel is somewhat doubtful, and a smaller general lounge separate from the main lounge would probably be more useful.

The drawing-room should be on the same floor level as the remainder of the public rooms if space permits, but if there does not appear to be any great objection it may be placed on the floor above the main public rooms, provided it is near the lifts and staircase. The outlook from the windows should be as pleasant as possible, and a southern or westerly aspect is to be preferred in seaside and country hotels.

With regard to the amount of space that should be provided in the form of lounges and rooms for similar purposes, it should be remembered that in luxury types and in hotels mainly used by travellers, a comparatively small area is needed in relation to the number of bedrooms, but in residential, seaside or resort hotels there must be sufficient public room space to seat practically the whole of the guests as well as additional space for casual visitors; it is very unsatisfactory to make it necessary to scramble through meals in order to be sure of a chair in the lounge afterwards, a procedure not uncommon in busy seasons in many hotels.

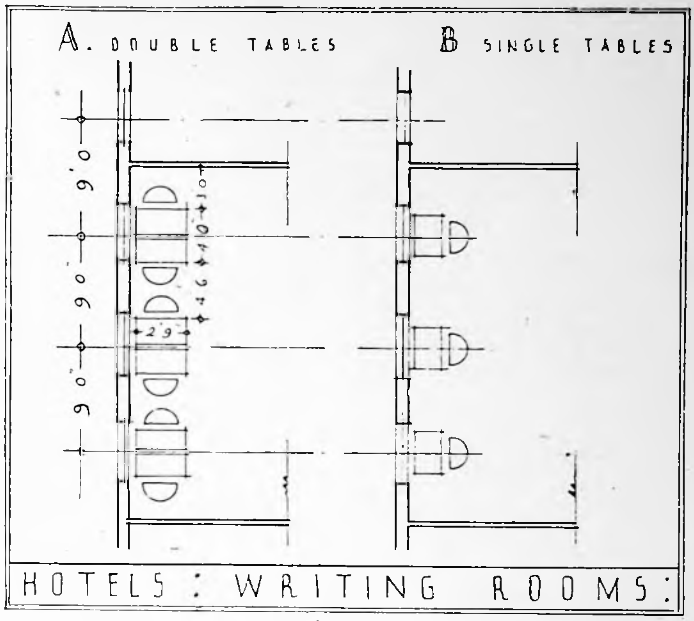

Figure 19

Writing Room—In nearly all hotels, regardless of size and type, some form of writing room is essential. In the luxury types only a small room is necessary, as writing facilities for most of the guests are provided in the individual bedrooms. In hotels mainly patronised by business guests, such as railway hotels and hotels in large cities and in those catering particularly for commercial travellers, the writing room is very important, and considerable space therefore should be provided. The room is also used, as a general rule, as a quiet reading room where conversation is practically forbidden and thus the floor area adjoining the walls may be used for writing tables while the central part of the room can be furnished with chairs suitable for reading. There are two main ways in which the writing tables may be arranged; one is with the writer facing the wall and the other is with the tables placed at right angles to the walls. The former method has some advantages, chiefly in that the writer sees less of what is taking place in the room and therefore is less distracted. But more writing accommodation can usually be provided if the latter is adopted and in this type two writing tables are often placed back to back so that the writers face one another, an arrangement which is undesirable unless a screen is used, high enough to prevent the two persons from seeing each other when seated. This screen is not very pleasant in appearance unless carefully designed. Writing tables should be at least 2 ft 9 in long per person and at least 18 in wide, exclusive of any fitting for stationery which may be placed on the table top.

Figure 19 illustrates the two types of lay-out of the tables in the writing room. Type A has the double-sided tables placed at right angles to the windows and Type B the tables facing the windows; it may be seen from the diagrams that Type A provides considerably more accommodation in a given length of wall than Type B; also, that if tables are wanted along the opposite wall, Type A is much better than Type B, as with the latter type the writer has his back to the light. The only contentious point is whether the tables should be placed in front of the windows or between them; if in front, it is difficult to reach the windows, and the view out is blocked to persons seated in chairs in the remainder of the room, but in the alternative type the light on the tables, if they are placed facing the wall, is unsatisfactory. Adequate and proper artificial light at the writing tables in addition to the general lighting of the room is essential, and should receive careful attention.

The room should be decorated and furnished in a quiet, restful manner and should be heavily carpeted to reduce noise of people entering the room. It is preferable that the room be on the ground floor level, but frequently, especially on crowded sites, the room (which is for the exclusive use of hotel guests and not for casual visitors) is placed either on a mezzanine included in the height of a high ground floor story, or on the first floor. It should only be placed on

the first floor if there are other public rooms on the same floor level, such as a small lounge or the drawing-room. The room does not need to be as high as main lounges, but good daylight is essential, and, whenever possible, a pleasant outlook, although this is not of such importance as in main lounges and, in the case of resort hotels, main restaurants.

Smoking Rooms—It is seldom, except in residential hotels, that a separate smoking room is provided, unless the designation is used to disguise a general lounge or bar lounge reserved exclusively for male visitors.

Children's Room—A number of hotels, in towns where the hotels are likely to have many child visitors, provide a special children's room. It should be a large room, and so placed that the noise from it, which is apt to be considerable, does not disturb the remainder of the public rooms. Special lavatory accommodation is desirable adjoining this room. The decoration and furniture should be such that it will be gay and cheerful and will not suffer from rather rough usage. In many seaside hotels the children's room has, in many instances, developed into a games room for the use of the younger guests (in addition to the children) in wet weather, where games such as table tennis, etc., may be played without having to make temporary arrangements in sun lounges, ball-rooms, etc. Odd-shaped rooms on any floor level may be used for this purpose, so long as fairly good light and air are available.

Billiard Room—The provision of a billiard room in most classes of hotels is becoming less frequent, mainly it seems due to the large amount of space occupied being less remunerative than when used for other purposes. The billiard room, when provided, may be in almost any position on the lower floors of the hotel, but they should be so placed that bar service is available, as without such service they do not appear to pay their way, and this provision can then only be justified on the grounds of providing an amusement for guests. They are occasionally incorporated in plans for luxury hotels or better class hotels in resort towns, but they still seem to find favour in commercial hotels. A full-size table is 12 ft 8 in long and 6 ft 8 in wide overall, and requires a room 25 ft long by 18 ft wide, and if two or more tables are placed in one room at least 6 ft should be allowed between tables. A room height of at least 12 ft should be provided. Daylight is not of importance, but when provided is best in the form of top-light. It must be borne in mind that the tables weigh about 30 cwt and must be on a very rigid floor. Seating space should be allowed outside the dimensions required for the playing area, and should be on the long side of the tables. The seating should be raised one or two steps above the normal floor level of the room ; this raised platform should be wide enough for tables as well as the actual space required for the seats. All doors should be so placed that they swing clear of the playing area.

Sun Lounges—Seaside and resort hotels usually need provision for open-air or partially enclosed sun lounges, which may be placed either on ground-floor level or, in some instances, on roofs. They should generally be capable of partial or complete enclosure, as a protection against wind, by glazed movable screens ; they should also, if possible, look out on to terraces or gardens. The roofing involves certain difficulties, for if projecting solid roofs are used the rooms behind the sun lounges are very dark except on the brightest days, while glazed roofs are not liked by many guests, as they cause the rooms to become excessively hot when in the direct sunlight. These problems may be partially overcome by providing clerestory lighting over the roof of balcony sun lounges to the rooms behind. The glare and heat of the sun may be reduced by the use of heat-resisting glass in glazed roofs. The alternative to providing sun lounges as definite rooms is to provide large awnings or blinds over parts of terraces, so that guests may sit in the open air without being in the direct sunlight.

Balconies or terraces covered by awnings are also appreciated by guests when attached to restaurants or lounges in town or city hotels, if they have a suitable outlook over gardens or parks. Care must be taken, however, that the awnings neither cut off the view from the tables or seats in the main room which they adjoin, nor cut off too much of the daylight so that artificial light has to be used in the daytime.

Roof Gardens—Few hotels have made use of their roof spaces for summer lounges or restaurants, more especially in large cities where such spaces have fine views and are cooler in hot weather. The great difficulty is to provide a roof space clear of obstructions, such as chimneys, tank rooms, fan casings, etc. and also adequate passenger and food lift services, without disturbing the occupants of the intervening floors by the noise of passengers and operation. Little attempt has been made in this country to use roofs for this purpose, partially, no doubt, because of the very limited number of days in the year when the climate warrants such a procedure. In many large cities abroad, however, the experiment has been successful. A further difficulty in this country is the height limit imposed by building by-laws.

Balconies—Guests at seaside and resort hotels seem to appreciate balconies attached to bedrooms, but they like them to be completely cut off from those used by the adjoining rooms, and this raises a rather difficult problem. Individual balconies to each room do not look very well, and are costly to construct, while the necessary divisions are equally unsightly on long continuous balconies. When balconies are provided it is essential that they project sufficiently to provide an adequate area for the swing of the doors in addition to the area necessary for one or more deck or similar chairs, according to the number of occupants of the room. Deck chairs with leg rests require a space of about 6 ft by 2 ft.

Food Service Rooms—The service of food may be required in one or more rooms in an hotel. It will be found that very complicated planning is involved when many rooms have to be served, as the food is stored, cooked and handled in one main kitchen, connected to the rooms in which the guests eat by means of service rooms either attached to the kitchen itself, or in many instances placed some considerable distance away. The core of all planning for food service must therefore be between the main kitchen and those rooms requiring the largest or most frequent service, which should be placed as near to the kitchen as possible. Restaurants which are the main dining-rooms of hotels, as well as grill rooms, when such are required, should be situated nearer to the kitchen than banqueting rooms or rooms such as tea lounges, in which meals are only required occasionally or during a short fixed period of the day. An hotel dining-room may be in use from very early in the day until very late the same night or even into the next day, and similar service is often needed for grill rooms. Many hotels serve meals only at fixed times, but many others do a considerable amount of outside or casual restaurant trade ; also some hotels serve only " table d'hôte " meals and others have at least part of their service " à la carte " ; all these factors should be known or anticipated before the food service rooms and their dependent rooms can be designed with real efficiency. Figure 20 attempts to illustrate diagrammatically the basic lay-out of food service for a moderately large hotel, having a restaurant, a grill room, some private dining-rooms and bedroom floor service, the latter being mainly used for breakfasts and not for meals in private sitting-rooms. Such an hotel caters for a considerable outside business, but does not have dancing or similar evening entertainments. Hotel guests use both the restaurant and grill room for lunch and dinner ; the grill room serving meals at all times from noon until midnight ; the restaurant being used at breakfast time and for fixed periods at midday and for dinner.

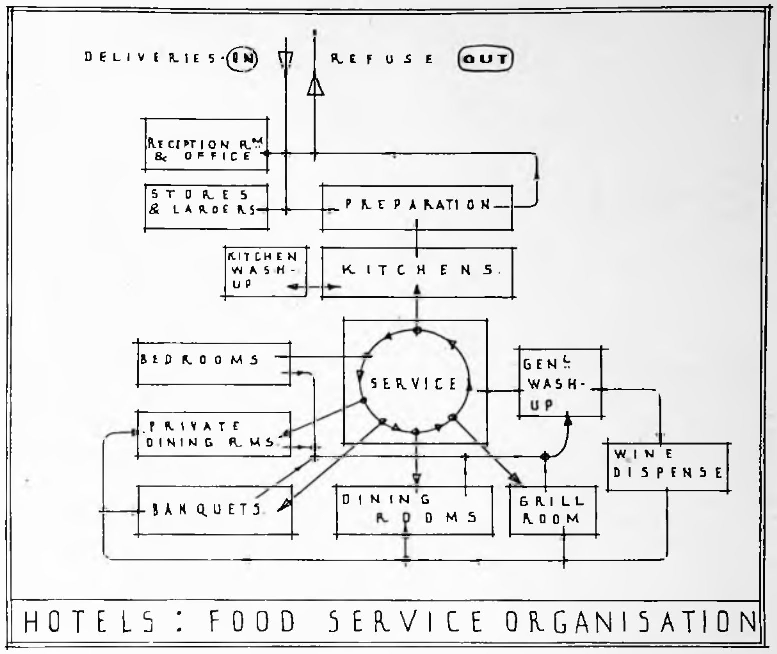

Figure 20

The main flow of goods for food service is from the goods entrance through the receiving room to the stores and larders, from which they pass through the preparation departments into the kitchen or directly to the service rooms, as necessary. Garbage and rubbish return to the goods entrance, whence they are removed. Attached to the kitchen is a wash-up for utensils. The prepared food passes from the kitchen through the service space, which may either be part of the kitchen itself, or may consist of one or more separate service rooms attached to the various dining-rooms. This service space, however it is arranged, is for the prepared food served to the dining-room, grill room, bedrooms, banquet rooms and private dining-rooms. In an hotel of this particular character, the service which handles the bedroom breakfasts may be used for the remainder of the day to deal with the private dining-rooms and banquet rooms. It is now usual to do all the washing up in one general wash-up attached to the main service kitchen, excepting in some cases when certain special china or glass may be retained and washed up in the separate departmental services in which it is used. The wine dispense has to serve all the various rooms and is itself fed from the cellars, which are supplied *via* the receiving room. The wine and spirit dispense is usually attached to the main service, but sometimes a secondary dispense is attached to banquet or other rooms when located far from the main dispense. Bars are of course stocked from the dispense or cellars before opening hours.

The seating capacity for hotels in the food rooms in regular use should exceed considerably the sleeping capacity of the hotel. Residential hotels and resort hotels for which little outside business is available, should have restaurant seating capacity for all the guests at one time, as in such hotels guests retain their tables throughout their stay and also meals are served only during a limited period between certain fixed hours. Hotels serving a travelling public should have, for preference, two rooms for meals, especially if commercial travellers are to be catered for, as it is general to provide a separate room and tariff for this class of business; the two rooms may then be used for slightly varied types of service, the one for formal meals between fixed times, and the latter for less formal meals served at all times, such an arrangement being generally found to be helpful as regards staff organisation.

The floor areas required for food service vary very much according to the type of hotel, the type of catering and meals, the amount of patronage from other than the hotel's own guests, banqueting services, etc. The minimum should be, however, a dining capacity for at least the number of persons for whom sleeping accommodation is provided, while the service space required to deal with the dining capacity will vary from about 50 per cent. to 100 per cent. of the area of the dining-rooms, inclusive of kitchens, stores, staff rooms and other dependencies.

The actual connection of the dining-rooms to the kitchen presents various problems. There are a number of methods, all of which are in use, and each seems to have its supporters among hotel managers, but it is an undoubted fact that the lay-out to be preferred is to have the restaurant adjoining the kitchen and on the same level, so that waiters enter the kitchen without a service room; this arrangement makes for easy and quick service as there are neither steps nor lifts to become congested, and orders are given direct to the kitchen without having tobe handled thro ugh a service room. A lay-out of this type can only be applied where the number of rooms to be served is small, and where they can be arranged conveniently round the kitchen. When the rooms requiring service, either by reason of their area in relation to the site area or because of their number, are such that the kitchen cannot be on the same level, one of several methods may be used; first, to place the kitchen on the same level as the room requiring the most continuous service with the remainder of the rooms at other levels; secondly, to place the kitchen at a half level between two floors, on each of which are restaurants; or, thirdly, to have the kitchen on a different level from that of the rooms and to connect up by means of lifts or staircases, or both. The question of lift or staircase connection is somewhat controversial, but is dependent on the type of service required. It seems, however, that when there is much "à la carte" service required, it is better for waiters to go themselves to the kitchen by means of staircases, as previously suggested, instead of having service rooms and lifts. If staircases are adopted very little space is needed for service rooms. However, it is impossible to lay down definite rules. as each case must be considered on its merits. Each manager appears to have his own very firm convictions regarding these matters and since he will have to run the finished building and its staff, he should determine what method of planning will suit the particular food service problem.

Restaurants— The lay-out of rooms to be used as restaurants should be given careful consideration, especially in relation to the entrances and exits to the service room or kitchen. A survey of existing restaurants shows that almost any shape may be adopted, but there seems little doubt that a long rectangular room, with the service doors placed on one of the long sides, is the most economical shape when full consideration is given to the table lay-out and to the time taken and disturbance caused to guests by waiters coming and going to the service room. A square shape is also good, but does not, as a general rule, lend itself to satisfactory planning of the remainder of the floor on which it is placed; this is particularly true if the room has to be large.

In practice it will be found very difficult to place the service entrances centrally on walls if several dining-rooms of various types have to be grouped round one servery or kitchen, but every effort should be made to

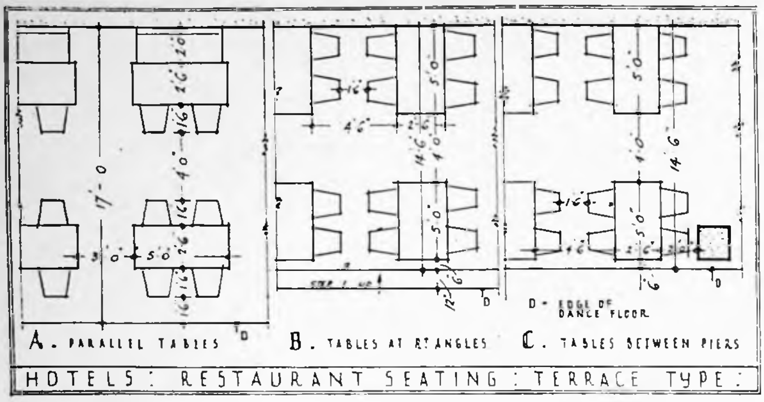

Figure 21

avoid service doors situated near the corner of rooms, as some of the waiters then have very long walks to their tables, which makes for slow service; guests at the tables near the door are, moreover, unnecessarily disturbed by the continual traffic of waiters. Entrance and exit doors are more convenient if placed either not too close to each other, or alternatively very close to one another, so that in the first case there is room for several tables between the main passageways, or, in the second type, one passageway serves for both directions; but this latter arrangement has the fault that waiters carrying loaded trays may knock one another unless the passageway between the tables is very wide.

It is an advantage in all restaurants to have the whole of the floor space clear of piers or columns, but this is not always convenient in planning the remainder of the building. A single row of columns placed centrally, or nearly so, in the room is really bad, although there are several examples where this has actually been done. When piers or columns have to be introduced they should be so placed in relation to the outside walls that the table lay-out is economical; alternatively the columns may be used to form bays or alcoves, if such are required, with or without fixed seats. Upper balconies are sometimes introduced in restaurants, but it does not seem the general practice in hotel restaurants, as the floor area involved in the well so formed is too valuable. On the other hand, low ceilings in relation to the size of the room should be specially avoided in all restaurants.

Floors, if possible, should be level, to assist service, as it is so much more difficult for waiters to move about with loaded trays if steps are introduced; but there is little doubt that the type of restaurant which has a raised terrace around the room is attractive in appearance, and has definite advantages in restaurants in which dance floors are included, and, more particularly, if cabaret performances are given. If raised "terraces" are introduced, their width should be determined very carefully with special reference to table sizes and lay-out, in order not to waste floor space, or, on the other hand, to cramp the guests in such a way that service is difficult to some of the seats. Figure 21 illustrates the minimum width of "terraces" and the minimum width which should be allowed between a wall and a row of columns placed parallel to it. It is obviously a waste of space if less than two rows of tables are used, one placed on each side of the service and approach gangway. The difference in width required by the two methods of table lay-out is clearly shown on the figure by comparing Diagrams A and B. Type A requires more space and also seems to have several faults, although it is a type of lay-out very frequently adopted in restaurants. Its main faults are the greater difficulty of service to the seats placed against the wall (and against the step of the "terrace" type) and the necessity of having sufficient space behind the chairs. Diagram C shows that tables cannot be placed with their edges nearer than 2 ft from the faces of columns to allow room to move chairs. When "terraces" are used it is wise to have protecting rails at the change of level and steps only at gangways; this does, however, reduce the flexibility of the seating lay-out. Where tables are placed on raised "terraces" or on balconies, there is less risk of dishes and food accidentally falling through the railings if tables are at right angles to the railings. Gangways, in the positions shown on this figure, as the main approaches both for guests and service, should not be less than 4 ft wide. These dimensions also apply to mezzanine balconies, with the exception that the tables are sometimes reduced in size to seat two persons each and are placed on one or both sides of the gangway. If mezzanine balconies are used, care should be taken that service doors are not placed near the guests' entrance to the level.

The floor area per person in dining-rooms varies very considerably. An analysis of the floor area allocated per seat varies from 10 sq. ft. to about 18 sq. ft., inclusive of passageways, tables, etc., but 14 sq. ft. is a good average. This should be increased to 15 or 16 sq. ft. in luxury hotels. Banquet rooms or tea-room type restaurants usually have the area per seat reduced to 8 to 10 sq. ft.; the latter figure is really the minimum for comfort if adequate passage space is allowed and reasonable sized tables are used. The seating of grill rooms is usually somewhat less in area than that required in main dining-rooms or more important restaurants.

Figures 21 and 22 illustrate the main minimum dimensions required for restaurant tables and their lay-out. Easy circulation for waiters is essential, with flexibility of numbers of patrons at tables, so that parties or large families may be accommodated at one table quickly without undue disturbance to the remainder of the room. The latter factor is extremely important in hotel restaurants which have a fairly large outside catering business. Tables vary somewhat in size according to the quality of the service to be provided; important restaurants in first-class hotels allow more table space per person than, for instance, commercial rooms in lower grade hotels. The dimensions shown on the figures should be taken as the absolute minimum. A variety of sizes is of great importance in hotels, but the greater number of tables are generally needed for one or two guests only, as strangers do not like sharing tables. Circular tables are not popular except for use by parties of five persons or more, but they have the great advantage of being capable of accommodating an extra person than the usual number with comparative ease. Circular tables require as much space as rectangular ones, but cannot be placed together to form large tables. Figure 23 shows the general spacing of tables; by placing square tables on the diagonal, as in Diagram A, there is a great saving in space over the type of lay-out shown in Diagram B,

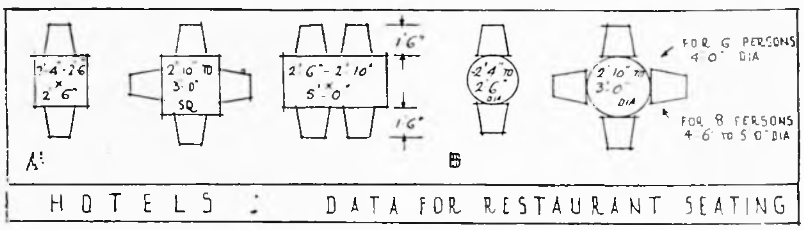

Figure 22

or on any other arrangement of tables, each accommodating four persons. The type shown in Diagram B seems to be preferred in the rooms used mainly by hotel guests, whereas the first type seems to be preferred in first-class restaurants catering for outside patronage, especially if there is dancing or similar entertainment. There should always be at least 3 ft. between backs of chairs if the space is to be used for service and this should be considerably increased for main circulation gangways; 18 in is the minimum space between backs of chairs when service space is not needed. The minimum width for each person is 24 in, but this is inadequate for single tables, as it allows very little space for dishes, etc. Tables are usually 30 in high. Special care should be given to the treatment or choice of wall surfaces at table level and the level of the backs of the chairs, as many surface finishes are apt to suffer considerable damage due to scratching and knocking.

Fixed seating, such as wall benches, is not general in hotel dining-rooms, except possibly in a room used almost exclusively as a combined ballroom-restaurant; for example, in the main restaurant of a first-class luxury type of hotel, such a type of room, being patronised by outside guests, does not depend to any large extent on hotel guests for its business. Fixed seating is generally wasteful of floor area, and is not sufficiently flexible to meet variations in the sizes of parties of guests; it tends to make the patrons stay too long, and thus provides a hindrance to a rapid succession of clients, with consequent loss of revenue.

An important factor in the planning of restaurants relates to entrance doors for guests; these must be kept well away from the doors leading to the service rooms, in order to avoid congestion between waiters and guests. The best position for the guest entrances is probably in the wall opposite the service doors, and the latter should be on one of the long walls; this is not always possible, however, especially when several dining-rooms are placed round one service room or kitchen.

The doors from the dining-room to the service room should be carefully screened, in order to prevent guests being able to see into the kitchen when seated in the restaurant. There are various methods of arranging this screening, some of which are shown in Figure 24. Opinions differ as to whether one or two doors should be provided between the room and the service, to form a lobby, eliminating the noise of the service and obstructing vision; two doors do not seem to reduce noise very much more than one door, and they present much greater difficulty to waiters passing through with loaded trays. Doors should always be hung to open in the direction of the traffic, and it is usual to hang them on the assumption that waiters carry their trays with the left hand and push the doors with the right hand. Doors should be protected—at least up to the middle rail—with metal sheathing. The scheme shown in Example A is the most satisfactory type, but occupies part of the kitchen space, which is so often somewhat cramped. The screen in Type B must be carefully designed in regard to its length, to obstruct the vision of the kitchen properly. Two doors should always be provided, so that the traffic in each direction is separated. The pairs of doors may be grouped together in one or more positions along the length of the room, which is preferable to making waiters walk about between the tables if only one entrance and one exit—far apart—are used in a long room. The lay-out of service doors shown in Type C, which is a double-door type, has the objection that doors have to be hung on alternate hands, which is a great disadvantage from the waiter's point of view; moreover, if two waiters are going in one direction at about the same time, both doors are opened together, allowing guests a clear view of the kitchen or service beyond. Type D is somewhat similar to Type A excepting that the screen is placed rather differently, but it has one advantage in the fact that the projection of the screen makes a clear way in each direction near the wall for the waiters; alternatively, a row of tables may be placed near the wall, projecting as far, if not farther, than the screen, thus placing the gangway forward from the wall, which forms an enlarged space near the service doors.

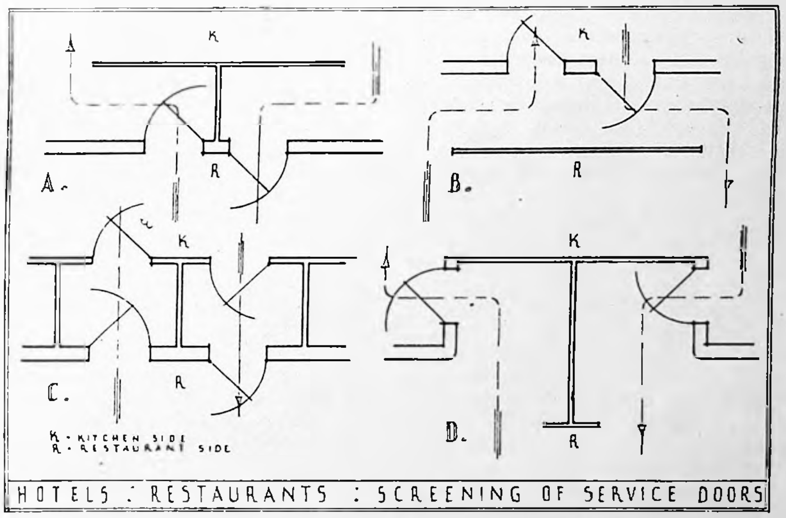

Figure 24

Dance Floors—Many restaurants and tea lounges require the provision of a dancing floor for part of the area of the room. As a general rule, restaurant floors are carpeted over their entire area, but a polished floor is provided under the carpet for use on special occasions. When dancing is a regular feature of a restaurant, the area generally used may be specially prepared with such provisions as a sprung floor, which is covered when not in use. When dancing has to be provided for as a regular part of the use of a room, it affects the planning to some extent. Figure 25 illustrates two typical tea lounges for seaside hotel restaurants,

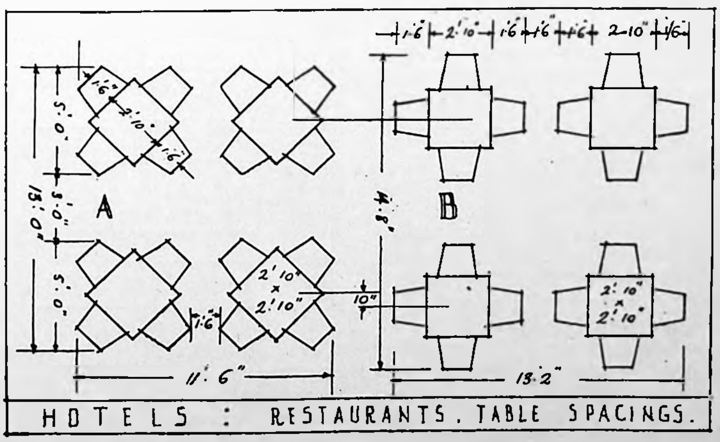

Figure 23

planned to accommodate a dance floor, and providing at the same time good views from the windows. The lay-out of the table spaces shows alternative schemes dependent on the position of the entrances. In both examples the long wall has the main view, and the band and services are placed on the opposite long wall. The guest entrances, especially in Type B, are separated from the service entrances. An amendment which might be made to these lay-outs, is to allow room for tables between the edge of the floor and the service gangway, in order to give guests the advantage of sitting at the edge of the floor, and also to keep the waiters and their trays away from the risk of being knocked into by the dancers. The main difference between the two examples is that Type A is more or less an external room or projection in front of the main line of the building, whereas Type B is included within the building and has only one frontage available for windows. Type A is more suitable for the lounge type and Type B more so for a restaurant, but in either example the windows can be used for access to terraces or gardens. Dance floors should be either square or rectangular, and not less than 20 ft wide in either direction. Circular floors are not generally liked unless they are very large. The position of the dance band does not seem of very great importance, except that it is better at the centre of a side or end and should always adjoin the dance floor itself. The band is often placed in a recess in order to make full use of the back wall as a resonant surface, but a deep recess or enclosed bandstand (unless it is against a wall) is unwise, as the sides obstruct the view of the floor from some of the tables. The band platform is often stepped and should always be raised at least 15 to 18 in above the general floor level, and should be at least 14 ft wide by 8 ft deep. The dance floor and band platform affect considerably the planning of the room as regards placing of entrances for guests and waiters, and variations on ideal restaurant lay-out schemes have to be used, such as the two shown in Figure 26. This figure shows two typical schemes, one in which the band is placed at the end of the room and the other arranged on the long side. Both examples show the main circulation, to give easy access for guests and waiters to all tables. Type B has advantages over Type A in-so-far as the guests and the service enter on a long side of the room opposite from one another ; in Type A the guest entrance generally has to be on one or other long side and the service entrance at the end ; if the service entrance is on one of the long sides, the waiters have to walk too far to some tables to give good service. The end position for the service door is thus forced on the designer, and this may complicate other food service planning.

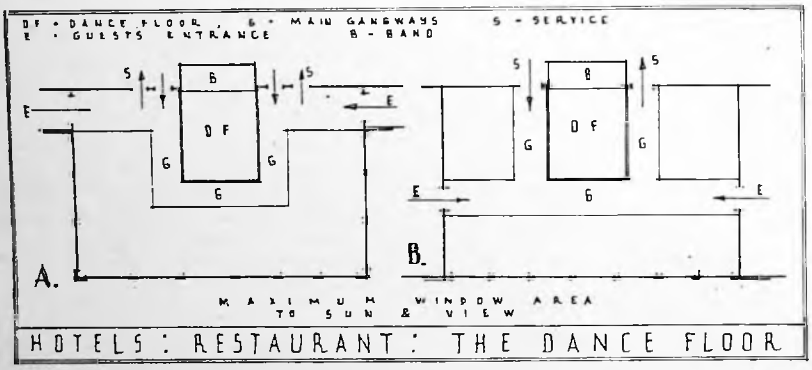

Figure 25

Banquet and Ball-rooms—Many hotels require the provision of one large room for use as a lettable room, apart from internal use by the hotel guests. This room usually has to provide for a number of functions as, for example, a banquet room, a ball-room, wedding receptions and temporary exhibitions. It is desirable that the room is placed on ground-floor or street level, although the basement has been used in some existing examples, but the ventilation problem needs very careful consideration if the latter position is adopted. If the room is to be let for uses apart from the hotel proper, a separate entrance is desirable, together with adequate cloakrooms and lavatories for each sex to cater for large crowds in short periods. The entrance should be placed so that vehicles can drive up to the door and the pavement should be protected with a marquise or *porte cochère*. At the entrance there should be a small vestibule leading into a hall from which the cloakrooms and lavatories are approached. This hall should be fairly large in size, as many people will often have to wait in it at the same time. The placing of cloakrooms sometimes presents difficulties, as it is impossible to find adequate space for both sexes on the same floor level as the entrance hall ; it is then usual to place the men's cloakrooms on the lower floor—either ground floor or basement—and the women's rooms on the upper of the two levels. It is often possible to arrange mezzanine floor levels, as the hall and banquet room are usually high rooms and such an arrangement permits of duplication of the similar rooms, one over the other, which simplifies drainage and services. If it is possible it is very advantageous to have large entrance doors into the banquet room, in the event of the room being used for exhibition or display purposes, in order to bring in exhibits even as large as motor-cars.

The size of the "ball-room" cannot be laid down except on a seating capacity basis for banqueting purposes ; such seating is generally much more cramped than for normal dining-room uses and the space is partly saved owing to the fact that a few large tables are used instead of many small ones. A good general average floor space per person in banquet rooms is 9 to 10 sq. ft., but on many occasions these figures seem to be reduced to about 7½ to 8 sq. ft. per person. The general shape should be partially dictated by acoustical requirements so that the distance from the seats of main speakers to all parts of the room is equalised ; amplified speech, by means of microphones and loudspeakers, can be made to overcome many difficulties, but good initial planning is always of the greatest importance. Banquet rooms are generally square or rectangular, the "high" table being placed against a long side of

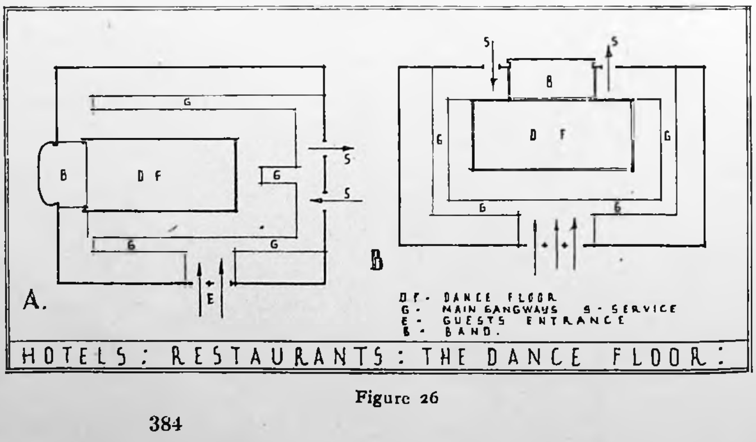

Figure 26

the room. A gallery is sometimes required, either for use of spectators or for an orchestra. When the room is used as a ball-room, it is general to place the band on a platform only slightly raised above the general floor level, as discussed previously. To find the area required for a fixed number of dancers, an allowance of 12 to 16 sq. ft. should be made for each couple. Figure 27 illustrates diagrammatically the basic lay-out of a ball-room suite, showing the entrance leading to the hall, from which the cloakrooms open and from which the ball-room is entered either

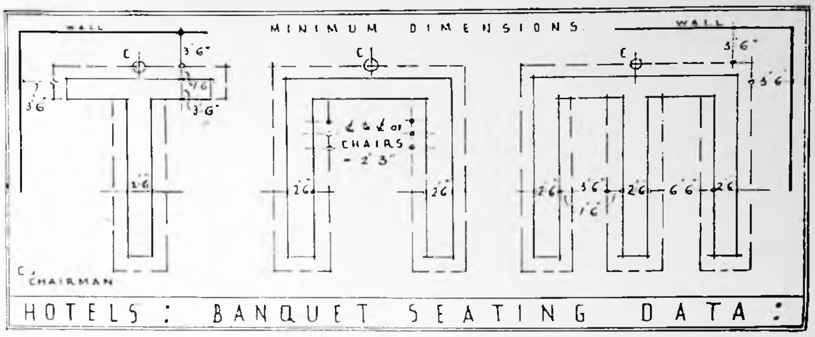

Figure 28

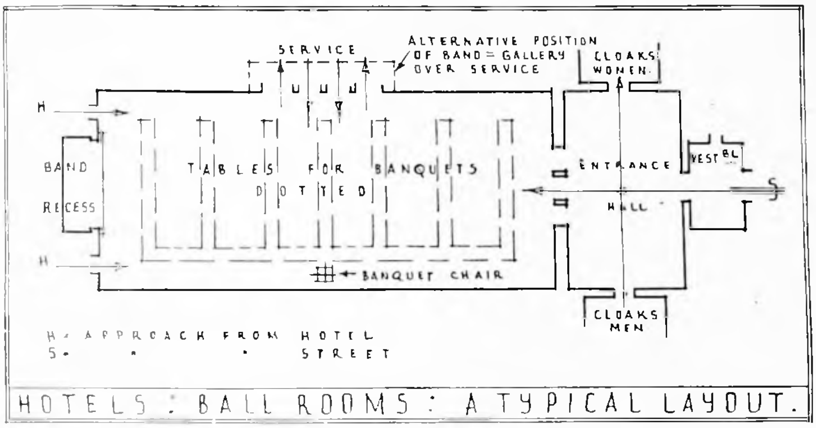

Figure 27

directly or cut off by a small ante-room. In large suites a reception or supper room is often added, which may be approached either from the hall or directly out of the ball-room ; a room such as suggested can be a very definite advantage when the room is regularly let out for dances, but is not essential for a ball-room used for dinner-dances or as a banquet room, although some reception and waiting space is very useful for banquets. It is better to enter such a room from one end ; although this is not ideal, it is almost essential, in order to leave one long side clear for service entrances, which should be, wherever possible, opposite the " high " table. The diagram shows alternative positions for the band, but the one opposite the " high " table is the most satisfactory for dining purposes, and for dancing it is by far the most desirable as the band is apt to become inaudible if at one end of a fairly long room. It is also important to consider the placing of the doors connecting the room to the hotel proper ; these should not be near service entrances and generally have to be at the opposite end to the main street entrance. This entrance from the hotel is often, particularly in resort hotels, just as important as the external entrance, as hotel guests may wish to return to the hotel lounge or their rooms between dances.

Figure 28 illustrates several typical table lay-outs for banquets ; in each example the service is placed opposite the " high " table, so that the waiters can enter the service gangways without circulating round the room. In a few examples the wine service is separated from the food service, and enters by doors on other walls, or on the same wall as the service doors but completely separate ; this is, of course, dependent on the lay-out of the service departments, which are largely governed by the views of the individual managers of hotels. The figure also shows good dimensions for banquet seating ; tables are usually about 2 ft 6 in wide and sometimes up to 3 ft ; the seats should be placed at about 2 ft 3 in centres, which may be increased or decreased by 3 in according to numbers to be seated. Gangways should be at least 3 ft 6 in wide to permit of two waiters passing with loaded dishes without difficulty. Wall or main gangways should be wider, if at all possible.

Ample storage space should be available adjoining banquet rooms for storage of tables and chairs when not in use. The service room may be used for this purpose if it is certain that it will only be used in conjunction with the banquet room when used for dining purposes only, but generally it is an unwise procedure, as service may be wanted in the room when used for other purposes. Collapsible tables are usual, and while these do not take up very much space, the chairs occupy a large volume even when stacked. The storage room must be near, as very rapid changes often have to be made, such as from a wedding reception ending at 5.30 or 6, to a dinner served at 7.30 p.m.

Whatever the use of the room may be, it is usual to provide a polished floor, even if it is often covered, but when dances are likely to be frequent a sprung floor is necessary, for which due allowance must be made in the floor thickness.

Good daylight is not essential in the ball-rooms of urban hotels, as the majority of functions take place after dark, but in resort hotels, especially at the seaside, direct access to terraces, covered lounges and gardens is an attraction which should be planned for whenever possible.

Artificial ventilation is virtually essential in all banquet and ball-rooms to avoid stuffiness, and in the former to exhaust smoke rapidly.

Private Dining-rooms—Most hotels require at least one room which can be let as a private dining-room for a small party, while in larger hotels several rooms may be required. When there are several rooms it should be possible to throw them together to make various sized rooms to accommodate parties of different numbers, large folding partitions being used as divisions. The smallest room should not be less than 14 ft by 16 ft. The rooms should be arranged in a group, with convenient access to a service room, on the ground or first floor of the building. The rooms are generally carpeted, but the larger ones should also have hardwood floors so that the rooms can be let for small private dances. The decoration and furnishing should be simple and generally of the character of a rather formal domestic dining-room.

Grill Rooms—The general arrangement and lay-out of grill rooms is similar to dining-rooms. Many hotels have a grill in the room, as the tradition of cooking in the room is still strong, especially in hotels with a large number of male patrons, or in those serving the better classes of commercial travellers. The grill, when used, must be in such a position that the flues can be suitably accommodated. Figure 29 shows the approximate area required for the grill itself, the working space for the chef

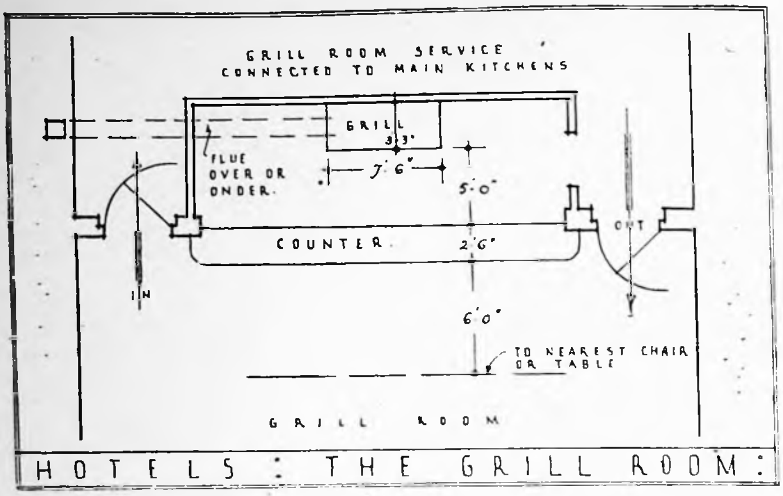

Figure 29

and the counter on which are displayed the various foods and upon which plates, etc., are stored. The diagram shows the approximate overall dimensions necessary for the whole apparatus involved in a reasonably large grill. The lay-out shown, where the grill is placed between the service doors, works well in practice and keeps the whole of the service together at one end of the room; it also permits the chef to go to the kitchen for supplies without walking about among the guests' tables.

Kitchens—The detailed planning and equipment of kitchens is a matter far too specialised for the scope of this section and consequently it is proposed to confine our notes to the essential factors affecting the main general planning only. It should be borne in mind that very many kitchens, together with their dependent rooms and stores, are much too small and cramped to produce efficient service; but equally too great a space causes excessive walking on the part of the staff, which is, in its turn, wasteful of time and energy. The real secret of efficient kitchens is in the lay-out of the equipment and the good quality and selection of the actual plant used.

The question of the best location for the kitchen has already been discussed and, when possible, should be on the same level as the rooms to be served. But there are certain other factors which should be considered at the same time. Daylight, although desirable, is not necessary in kitchens, especially if it involves loss of wall space which might be used for subsidiary departments or for the placing of apparatus. Daylight can sometimes be provided by placing the kitchen under a light well or open court formed by the upper floors, but if such a position is chosen great care must be taken to guard against the smell of cooking penetrating to bedrooms, or, in fact, any rooms used by the hotel guests and also to see that noise does not disturb guests whose rooms overlook the area. Sometimes in deciding the location of a kitchen it may be found that space is available on the same floor as the main room to be served, but only at the expense of the loss of revenue from other rooms or possibly shops which would otherwise occupy the same floor area; care must then be taken to weigh up the relative merits and rental values in order to reach a decision; but it is most important not to overlook the possibility of producing slow and bad service by any sort of plan which might spoil the normal restaurant business and affect the general returns of the hotel, causing a greater loss than could be made up by the rentals produced by using the space for other purposes. The question of ventilation should not affect the design or the location of the kitchen, as forced ventilation is really essential to control the supply of air and the smell of cooking; most engineers dislike any likelihood of natural ventilation of kitchens, because, as a rule, it defeats the ventilation system and causes complaints from guests in regard to both odours and noise.

The shape and area required for kitchens and the dependent rooms varies very much according to the type of hotel and its food service. The one important point to bear in mind is that large spaces clear of columns, piers and supporting walls, aid the kitchen equipment specialist enormously to produce an efficient lay-out. It is not essential to have all the dependent rooms on the same level, but if divisions of floor level have to be made, the main kitchen, service and preparation rooms must be together. Main bulk stores, staff rooms and independent departments such as the bakehouse, linen, wine cellars, etc., may be separated. The area required for the kitchen proper, which is the actual preparation, cooking and service area exclusive of store room space, locker and toilet rooms for the staff, varies from 35 per cent to 50 per cent of the aggregate dining-room areas and at least 40 per cent to 45 per cent should be allowed for all normal purposes. The smaller figures should only be considered when the meals to be served are mainly "table d'hôte" and to a limited menu, as is the general practice in many smaller and lower-grade types of hotels; for all hotels where the service has a considerable demand for meals "à la carte" and caters for a large variety of foods, the 50 per cent figure is more likely to be needed. The total area required for the kitchen and the dependent departments is likely to be as much as 100 per cent of the total of the dining-room areas in first-class and luxury hotels having a normal amount of outside restaurant business. Figure 30 illustrates the general basic circulation of food in the kitchen. The food enters and is taken to the larders—in the case of perishable food—and to bulk storage for the remainder. It is then passed to the preparation and cooking sections, which in their turn pass the food to the service counters in the kitchen or to the service rooms adjoining the various dining-rooms. If service space is to be provided in the kitchen at least 6 ft is necessary, and preferably 10 or 12 ft where large numbers of waiters are employed. If staircases are required to other levels they should enter and leave from this same service space. Such stairs should be at least 3 ft wide or slightly more, and the traffic in each direction should be either separated by a handrail and balustrade, or, better still be placed apart in separate positions. The arrangement of the departments or sections of the kitchen should be planned to avoid as much cross-traffic as possible, and the service counter, which is usually divided into sections for differing purposes, should be laid out in a sequence which best suits the service of the most important room. The service counter consists of hot and cold cupboards, *bain-maries*, etc., in which the food, plates and dishes are kept hot or cold as required; along the counter should be a continuous tray shelf on which the waiters may rest and push along their trays.

Storage is a very important section of the kitchen plan, and it may be divided into two main groups; first, local storage in and adjoining preparation departments and, secondly, main bulk storage of goods of all types. The first type of storage generally consists of shelving, bins and refrigerators, each specially chosen to suit the particular goods to be handled and maintained at varying temperatures to suit each category. Bulk storage also has to be divided into two main groups; firstly, food which needs either cool storage or refrigeration, such as fish, meat, vegetables and dairy produce, and, secondly, dry, cased or tinned goods which may be placed in large open store rooms fitted with suitable shelving and bins.

Shelving should be either of hardwood or metal and the bins of wood, sheet metal or stout wire mesh. Floors should be suitable for moving heavy loads on trucks and be able to withstand the tipping and dropping of packing cases. In most hotels the steward's office or goods reception office adjoins the bulk storage, so that all goods are properly weighed and checked on arrival. Large scales are an essential installation. In large hotels an issuing counter is necessary so that only the storekeeper and his assistants enter the actual store rooms, the kitchen porters and cooks collecting what they need from a hatch. The amount of storage space required varies very much with the size of the hotel and its proximity to markets for the various types of goods. In larger hotels the refrigeration section may become very large, requiring as many as six rooms—each of 70 (or more) sq. ft. in area—maintained at different temperatures to suit the type of food kept in each compartment. A central plant is usually used to provide ice requirements and also to cool the various refrigerators throughout the building, with the exception of small independent units in such positions as bedroom floor service rooms, which may not be economically serviced from the main installation.

Back Entrance—In smaller hotels, goods and staff use the same entrance, but in larger hotels there should be separate entrances. Each must be controlled so as to check persons and goods entering and leaving the hotel. At or near the goods entrance should be the steward's office and bulk store rooms, so that the clerk on duty may check all goods passing the entrance and also receive parcels and deliveries for transmission to guests' rooms. If store rooms and entrances are at a lower level than the pavement, adequate-sized lifts, hoists or ramps, the gradients of which are easy, must be installed. Goods lifts must be large enough to carry large packing cases, laundry baskets, sides of meat, etc., on a truck or trolley with a man in charge, and should, therefore, be about 6 ft by 4 ft in size. Steps and stairs should be eliminated whenever possible in all service departments, slight changes in level being taken up in ramps, so that trolleys and bins on wheels may be taken everywhere.

Figure 31 illustrates a typical hotel back entrance in which a backing-in space for vehicles is provided, but not an unloading dock, as in this example it serves also as a staff entrance. The clerk's office controls the whole unloading space and also the parcels room and time clocks. The weighing machine should be placed between the entrance and the goods lift. The staircase to the basement is near the lift and is not used to reach the staff rooms, but only the goods stores, boiler room, etc. The staff all have to pass the clocks to reach their locker rooms. A ground floor receiving department is preferable, although it is often impossible to plan on many sites. The goods entrance should be placed where vans may wait while unloading without interrupting traffic, and, if it can be arranged, a backing-in space under cover is very desirable.

The staff entrance should lead as directly as can be managed to the locker rooms, passing time-recording clocks and a timekeeper's or paymaster's office.

Locker Rooms—Locker, changing and toilet rooms are necessary for all the staff who do not sleep in the building; in most hotels some or all the chambermaids, and the unmarried members of the office and managerial staff only are resident. Each section of the staff is usually separated; waiters from kitchen staff or porters and each section has one or more locker rooms, as necessary for the numbers involved.

Locker rooms and staff toilets are generally placed in basements and are consequently artificially lighted and ventilated, but this does not matter if efficient mechanical equipment is provided, since the rooms are only occupied for such a short time by each person during the day.

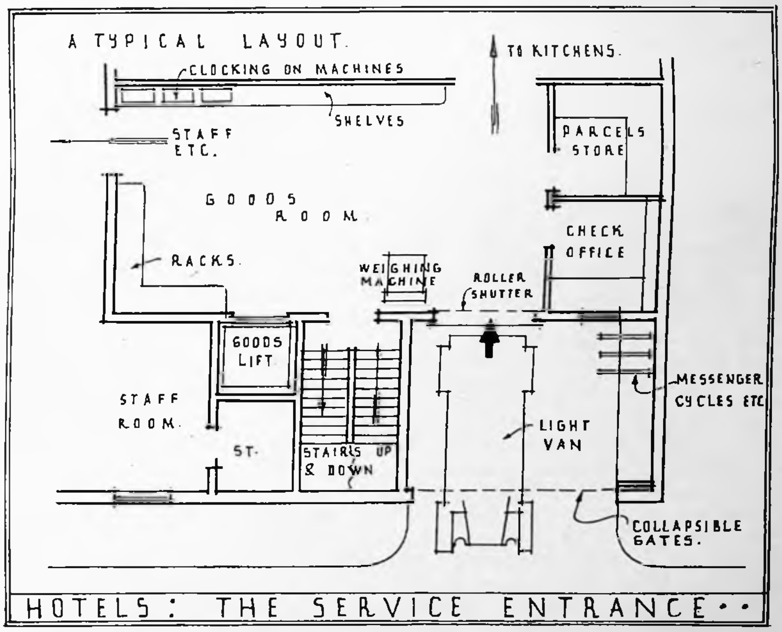

Figure 31

The staffs of separate departments, such as engineering, laundry (if any) and barber's shop, each require locker accommodation near the respective departments.

Employees' Dining-rooms—Some hotels provide catering facilities for part or the whole of their staff, sometimes on cafeteria lines in one or more rooms, separating various grades or sections of the staff. It is usual to feed the kitchen staff, maids, cashiers, office staff and all who live in, at the expense of the hotel, the wages being suitably adjusted, and if feeding arrangements are made for the remainder, they bear the cost

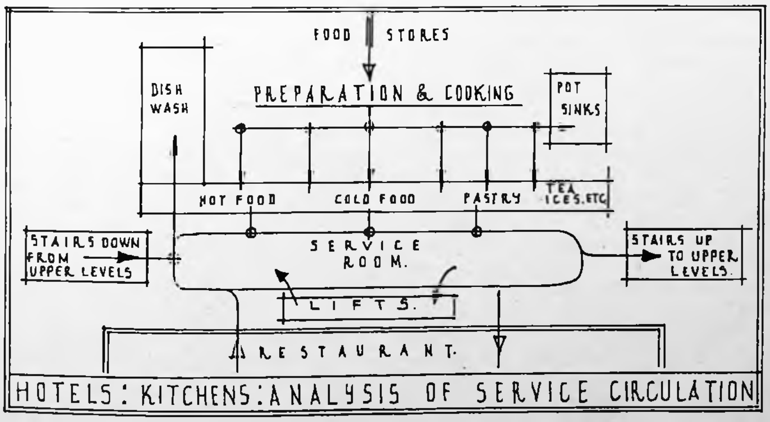

Figure 30

themselves. A separate kitchen is seldom necessary except in very large hotels, but a separate service room is usual, as special china, etc., is used for these rooms.

Visiting Servants—In better-grade hotels, facilities must be provided to sleep and feed guests' personal servants such as chauffeurs, ladies' maids, valets. These usually take their meals either in a room specially set aside for the purpose, and sometimes called the "stewards' room," or in a dining-room used by a suitable grade of the staff. A number of small single bedrooms must be provided, preferably grouped together, with a common room or separate rooms for each sex. In country or resort hotels on open sites, chauffeurs and men servants are often placed over garages, while the maids are usually grouped with the rooms for the female staff of the hotel. Nurses, secretaries, couriers, and similar more important grades of guests' personal servants usually eat in the dining-room, either alone, in a group, or with their employers and occupy the less expensive single rooms on the ordinary bedroom floors.

Staff Bedrooms—Bedrooms have to be provided for all members of staff who live in. The manager usually has a suite consisting of a bedroom, a sitting-room and bathroom, in a fairly accessible position. The remainder of the managerial staff have small single rooms in unimportant positions on the plan, such as darker corners, rooms with bad prospect and top floors. Each sex must be quite separate. Maids are generally grouped together in one position, either in dormitories, cubicles, or rooms shared by two or three; the latter is generally preferable. Suitable toilet facilities must be provided on generous lines, together with one—or better, two sitting-rooms—one as a quiet room and the other where a gramophone or wireless may be played. A small laundry room is also desirable so that maids can do their own washing. Maids' rooms should be on a top floor or in a separate wing. The housekeeper, who controls the whole female staff, also needs a suite consisting of an office, a bed-sitting-room and a bathroom, but sometimes the office is placed in the working part of the hotel, and her bedroom near the maids' rooms, in order to control the latter more adequately.

Staff Valet Rooms—Most hotels having a fairly large staff have a uniform room in which spare uniforms are stored and issued and also uniforms can be cleaned and pressed. These rooms may be conveniently placed near the staff locker rooms.

Garbage—Garbage collection and disposal present a very difficult problem in hotels. The sources of garbage are numerous and of very varied types; there is waste paper, general rubbish and dust from bedrooms, waste food, peelings and similar wet rubbish, also tins, jars, bottles and boxes from kitchens, ashes from boilers, coal fires and ranges, trade rubbish from workshops and so on. Most of these have a small value which in many hotels justifies proper collection, sorting and removal. Some space in basements must therefore be devoted to storage, sorting and baling. Kitchen and other food waste is generally collected in bins and disposed of as pig food; bins for this purpose have to be stored near the kitchen, especially near the dish washing section, where they are mostly used, and then retained in some ventilated space near the entrance, but where the smell may be controlled and removal to the street is easy.

Linen—Bulk storage of linen together with dirty linen store and mending rooms, should be placed in the basement. If possible a chute should connect bedroom floors to the basement, where a room for sorting and packing should be placed; this room needs to be fairly large to allow space for storage of baskets, sorting and counting. It is advantageous to have this room in an accessible position in relation to the back entrance for easy removal of baskets, and also near the clean linen room, where the baskets arrive. The main linen room for clean stock must also be large, to accommodate the amount of shelf space necessary, together with sorting and inspection tables, on which the linen—such as large sheets and towels—may be opened to look for damage which needs repairing. Adjoining the main room should be placed the sewing room in which all repairs are carried out. The size of these rooms depends on the size of the hotel, on the nature of the business (as in some hotels clean sheets, towels, serviettes, etc., are required for every room each day and every diner at every meal, while in others sheets may only be changed once or twice each week), and on the rapidity of laundry service.

Service Rooms—There are a number of general and specialised rooms required in connection with the operation of the hotel building, in addition to the service rooms previously mentioned in direct association with bedroom floors, offices, public rooms and kitchens. Such special rooms as those required for the engineering works are likely to be large in area and require considerable height; these rooms consist, generally, of the boiler-room, fuel stores, space for plant such as vacuum cleaning, pumps for raising water to tanks on upper floors, well rooms, refrigerator plant, engineers' office and workshop. The areas necessary are obviously dependent entirely on the size of the hotel and the amount of mechanical equipment and service machinery needed, but care should be taken not to cramp the spaces for these services, as much of the plant has to be duplicated to guard against breakdown and also allowance must be made for possible additions to the plant in the future. All these rooms may be placed satisfactorily in basements as daylight is not of importance.

Workshops—One or more workshops are generally provided either in or near a hotel where repairs to furniture, etc., may be undertaken, except in small hotels which are not large enough to justify the constant employment of workmen and where savings may be made by putting the work out to local firms. Some provision should be made for a small printing press for menus and similar small work, except in the smallest hotels; in large hotels the printing shop is often much larger and prints practically everything necessary for the hotel's use. The main types of work undertaken in hotel workshops are repairs to furniture, fittings, plumbing, etc., but the making of new fittings or rebuilding is generally given to outside firms. The workshops have to provide for the following trades:—engineers, electricians, plumbers, glaziers, joiners and cabinet makers, polishers, painters, upholsterers—including curtain makers and mattress repairers. These shops, when necessary, may be placed either in basements, on top floors (for the lighter trades only) or in a separate building which must be in close proximity, as it should be remembered that most repairs have to be executed rapidly and at a moment's notice, and in many hotels time is more important than cost. In many large hotels the "works department" becomes very large and therefore needs a considerable area of floor space. Some hotels have as many as fifty employees under a works manager, who requires an office where he may interview travellers, salesmen, etc., and have a clerk or bookkeeper. Easy access for materials is important, especially as some of the deliveries may be large or bulky. Noise and smells from paint, etc., must be controlled and kept away from all public and guests' sections of the hotel.

Telephones—A small set of rooms is required for the telephone equipment consisting of a switch room with one or more switchboards, as necessary, a locker room, rest room and toilet facilities for the operators, except in small hotels when the switchboard may be placed either in the hotel office or in the Porter's office.

Laundry—A few of the large hotels operate their own laundries and it is surprising to find that this is not a more general practice. Owing to high site values and height limitations in England, it is not often

feasible to house the laundry in the building, as is often done in American hotels. Many American hotels, with as few as 60 bedrooms, operate a private laundry (and show considerable cost savings) for " flat work " such as sheets, towels, table linen. The remainder of the work, especially the personal clothing of guests, requires a great increase in equipment and labour and can, therefore, only be justified in large schemes, unless outside trade can also be obtained. The planning requirements of such a specialised type of building are outside the scope of this section.

Concession Spaces—Many hotels derive additional income by the provision of stalls, hairdressing rooms and special treatment baths (Turkish, light, etc.,) within the building apart altogether from any shops which may form part of the street frontages. These special " internal " shops may be operated by the hotel itself, or may be leased as concessions to outside shopkeepers. The most general provision is a stall, or stalls, for the sale of papers and stationery, tobacco, confectionery and flowers ; such stalls may well be approached from the main entrance or lounge space and in many examples are merely counter fittings in the hall.

In addition to these stalls, showcases for clothes, jewellery, perfumes and similar luxury articles are placed in main corridors, sometimes in charge of an attendant who sells on behalf of the lessees, or alternatively merely as unattended advertising show spaces. Another and general provision in larger hotels is a men's hairdressing department and, in the better types of hotel, a women's hairdressing department ; these may be placed in any part of the hotel in which the guests normally circulate, but should not be on bedroom floors except possibly the ladies department (if it is on the lowest bedroom floor,) with easy access from the public rooms.

Some hotels also provide for special facilities such as swimming baths, Turkish and other treatment baths, but the problems of the individual planning of such units is considered to be a special subject outside the scope of this section.

Garages—The garage problem, in conjunction with hotels, presents many difficulties, because a very large number of guests may arrive with cars and require a " room and garage." The problem may be overcome easily in country or resort hotels on open sites, but those in urban, and especially central urban sites cannot, as a general rule, acquire a site of sufficient area on which to build a garage building in addition to the hotel accommodation. When, however, such a site is available, a multi-story garage can be built and the hotel provides for a night load at times when local car-parking is not available and should therefore help to make a profitable undertaking. Where the area covered by the hotel is sufficiently large, a portion of the basement may well be allocated to garage accommodation. Such a garage would be approached by suitable ramps, preferably from back or side streets. In such a plan, care must be taken to ascertain and comply with the usual fire regulations of the locality, especially with regard to the relation of the hotel fire escapes to those of the garage, fireproofing of the garage ceilings (including the provision of a sprinkler system) and the relegation of petrol pumps to a position outside the main wall faces of the hotel building. For country hotels, ranges of lock-up garages around a yard with a repair shop, pumps, etc., is the best arrangement, but care should be taken to try and select a position where the noise and disturbance do not detract from the comfort of the guests' bedrooms. Visiting chauffeurs' accommodation may, with advantage, be placed over garages. The necessary sizes for garages are given in the section on " The Motor Vehicle."

Stables—In many country districts accommodation is still required occasionally for guests' horses, but it is questionable whether such a provision is necessary in a new hotel, as there is usually suitable accommodation available in the neighbourhood.

General Finishes, etc—Throughout the whole of hotel planning and equipment the strictest care should be taken to provide only those materials, fittings, and equipment which make for the minimum of cleaning, upkeep and replacement. This particularly applies to floor finishes, careful choice of woods, linoleums, carpets, etc. ; in furnishing, to the strength of furniture, the quality of hangings and upholstery, etc. ; in fittings, to the strength and quality of locks, etc, and of all electrical and plumbing equipment.

The work of upkeep and replacements involves inconvenience, disturbance and noise and, although the cost may be small, the ultimate financial loss may be much greater than the first cost of good materials and first-class workmanship.

NOTES

27. *Public Houses*

Introduction—The previous section was devoted to the subject of hotels; it was stressed there that the word "hotel" was applied to buildings where sleeping accommodation formed an essential and main part of the scheme; in this section the buildings discussed are of a similar nature, but, while some guest bedroom accommodation may be provided, the main source of profit of the undertaking is from the licensed trade.

The public house has changed its character considerably in recent years, in certain districts more than in others, and it now has to be considered to be as something in the nature of a club for refreshment and entertainment.

There are two main types of licence, first, that of the beer house, in which, as it names denotes, beer alone may be served and, secondly, full licences for the sale of all types of alcoholic drinks. The majority of public houses are owned by the brewery companies, although there are a certain number of "free houses." The general tendency, especially in regard to new licences, is towards brewery-owned houses.

All licences are controlled by the local licensing justices. Unfortunately, the requirements and views of the benches of justices vary considerably, in different districts, and it is necessary to ascertain their outlook when planning for a particular locality. All schemes, both new and alterations, have to be submitted to the licensing justices before any work may be commenced.

Much has been said and written about the evils and virtues of "standing at the bar drinking," but there now appears to be a tendency to provide more seating, and this has considerable bearing on public house planning. A given number of customers require much more space when seated at tables than when standing. Bars of the lounge types also require to be planned, furnished and decorated more as family clubrooms in order to avoid the effect of mere drinking space.

Types of Houses—The type of house has considerable bearing on planning, and the type of rooms to be provided; the main sub-divisions are small houses in towns, large houses in towns, houses on important sites in suburban or country districts, and houses on the open road or in villages.

The small houses in towns usually cater for the needs of the inhabitants of a particular locality, and are often placed in lesser and unimportant streets mainly in semi-residential areas; these are often beer houses rather than fully licensed houses. The main room in this type of house is the public bar, but another bar, even if quite small, should be provided. A clubroom is very desirable, which can be used for trade union, Oddfellows and similar club meetings. Little is required as regards food catering in this type of house.

The larger houses in towns as a rule have full licences, and consequently are used by a better class of customer. Their sites are often in the more important streets of the town or locality. Several bars of different types, such as public, saloon and lounge, are essential. Provision may be needed in this type of house for lunches or for dances, lodges and dinners.

Houses on important sites in towns or country districts usually cater mainly for a passing trade. The saloon and lounge bars are of greater importance. Good dining facilities are likely to be needed, and facilities for quick snacks at certain of the bars. Country houses of this type need, and, where the site permits, should always be provided with adequate car parking space, and, whenever possible, gardens for customers to sit in.

Country houses are of two main types, the large ones as summarised above, and the smaller ones either in isolated places or in small villages, catering mainly for a pasing trade and a local custom from a fairly wide area. The smaller country house is often only a beer house, but its function as a club or meeting-place for the local inhabitants is an important feature in country life.

Living accommodation should be provided for the licensee in all public houses, and it is customary for some, if not most, of the staff to "live-in."

Many houses have an off-licence department for the sale of liquor to be consumed off the premises. A children's room is desirable, especially in urban districts, since children under sixteen years of age are not allowed to enter the bar spaces. Separate bars are sometimes provided for women, but this seems to be growing less necessary in all better-class houses. Lavatory accommodation for both sexes must be provided, and be accessible from all bars.

Sites—The selection of sites for public houses seldom falls to the lot of the architect, although his advice as to the accommodation which might be provided on a given site may be sought very early in a project. The relationship to population and passing traffic are important factors in site selection; aspect and similar factors matter comparatively little.

Sites for houses on main roads should have a large site area in order to provide large car parks, especially if there is likely to be a large dining-room trade. It is important that cars should not be parked on the public highway. It is also desirable, although very frequently quite impossible, to provide for deliveries to be made from a yard both to the cellars and the kitchens; on many sites, however, it is not possible to arrange the deliveries to the beer cellars except through an opening in the pavement or forecourt.

Corner sites appear to be preferred to all others, due to prominence of position. Signs should be considered very carefully in relation to site planning—more particularly when buildings are set back from the road. When planning for the rebuilding of a public house, it is often advantageous to set back to form a forecourt as a car park, while at the same time this permits the existing building to be used in its entirety until the new building is complete. Rebuilding existing houses is greatly complicated by the necessity of keeping a part of the licensed space in constant use.

Figure 1 illustrates two typical town sites of public houses. Diagram A shows a very restricted site between party walls; two light wells have been introduced, while all the entrances are along the frontage, and are separated as much as the site will permit. Three bars are provided, in addition to an off-sales counter. The entrances, except to the off-sales, are set back to avoid placing the two doors side by side on the main elevation, and also to accommodate the cellar flap without obstruction to the footpath. Diagram B shows a corner site at the junction of a main and a secondary road, and again there are two party walls as boundaries. The service entrance is placed at the end of the frontage to the secondary road, and the entrances to the three bars and off-sales are distributed along the two frontages. The cellar flap is placed in the secondary street in preference to the main street, to avoid traffic congestion as far as possible. Owing to the nature of the trade the public bar is given the most important frontage, but the saloon bar entrance in the minor street is placed very near the corner.

Figure 2 illustrates a public house on

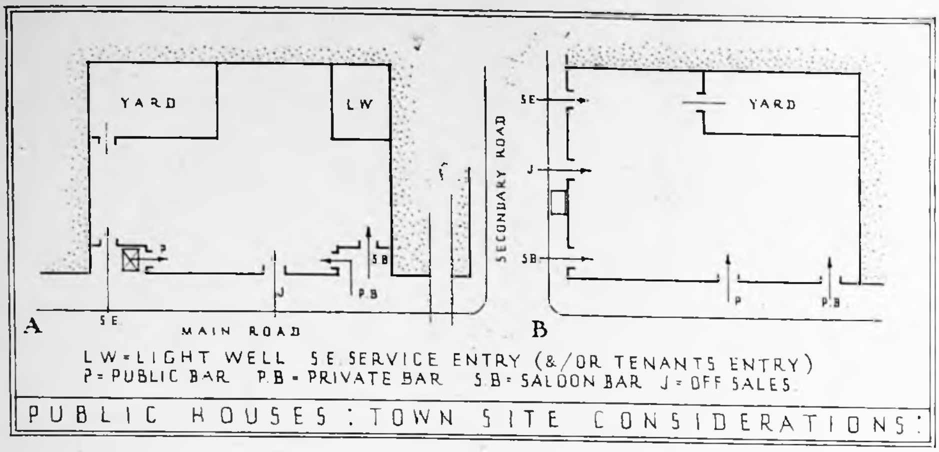

Figure 1

a less congested site than those shown in Figure 1. The site permits the building to be set well back from the main road in order to provide a car park; car-parking spaces should be arranged so that cars can be placed in such a way as not to obstruct the easy movement of any vehicle. This scheme provides for a restaurant which is placed in a wing apart from the bars—a planning point that should be particularly noticed, as it permits the service of teas and similar meals in non-licensed hours without the complication of closing an ordinary bar-counter by shutters or other similar means; it also permits the use of the room by children.

The scheme is planned to allow for circulation of service vehicles round the buildings, through the service yard space and past the cellar flap, which is placed at the back of the building, thus freeing the parking space and footways for public use at all times.

When planning entrances and exits to yards, the average sizes and maximum turning circles of delivery lorries and drays should be allowed for. The yard space might well be planned to give a garden view from the restaurant windows by placing the yard gates nearer the service entrance. The lounge entrance is planned near the restaurant, as these two rooms are likely to be used, in part, by the same customers. The saloon and public bars both have their entrances on the main frontage. The sign is placed on the front boundary of the site in order to be visible to rapidly moving traffic in the street.

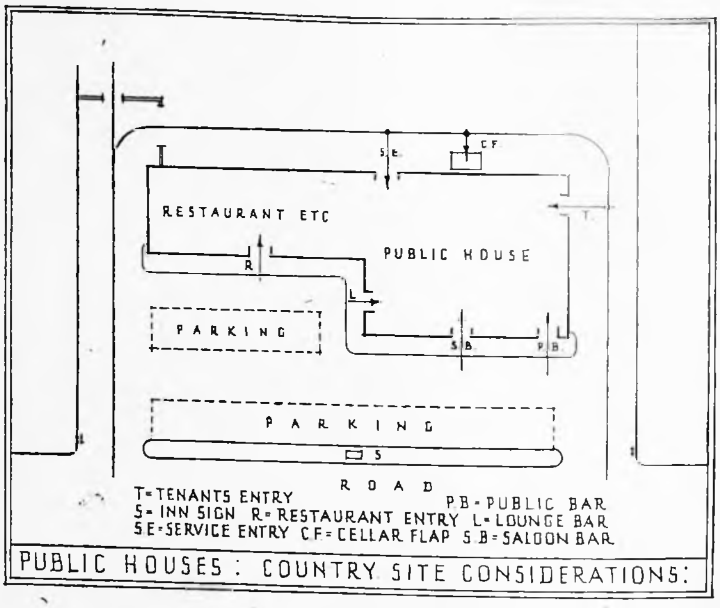

Figure 2

General Lay-out—The ground floor is by far the most important part of a public house plan, as the greater part of the service has to take place at this level, and generally all the bars are planned at street level with only dining and club rooms placed on an upper floor. The important factor controlling the plan is the necessity of complete supervision of all drinking space by the licensee and his staff from the service bars behind the counters; equally, the service spaces must be planned in very close proximity for supervision by the licensee and must be intercommunicating. Customers in the separate bars should not be able to see one another. The whole plan, therefore, revolves round the service bars, from which access should be arranged to the cellars and to the licensee's private sitting-room or living-quarters. It is most important, before commencing a general lay-out plan, to know how the beer is to be stored and served. In large houses, especially in towns, basement beer cellars are usual with pipe connections from the casks in the cellars to beer engines on the counters. Some houses in country districts have ground-floor storage, and in small houses the casks are kept in a servery or in the bars. Each bar should have a separate entrance from the street, and whenever possible there should also be an entrance to the licensee's private rooms which may also be used as service entrance, if a separate one cannot be provided for this purpose. The private entrance should be cut off from any public space. Lavatories must be available for both sexes from all bars.

In urban areas with restricted sites, dining-rooms are often placed on upper floors and should have the kitchens planned adjoining with lift connection to the bars for food service in these latter rooms; on less restricted sites the dining-room is better placed at ground-floor level. The number and type of bars is entirely dependent on the locality and classes of customers likely to use the house. The cellar, when in a basement, should be planned as directly below the bar counters as possible to reduce the lengths of piping; external access at street level for deliveries is essential for all cellars. The cellar should be connected to the bars by means of a staircase and hoists or lifts. This staircase should not be available to the public and should be approached from within the service counter area. The hoist should also deliver in the counter spaces either in the back-bar fitting or under the counter, or in a lobby connecting the counter spaces of several bars.

It is essential that all bars have good daylight, preferably from the

street or streets and not from internal areas or wells.

Living quarters for the licensee vary according to the type of house ; generally, two living-rooms are needed for larger houses, and three or four bedrooms and a kitchen. Staff rooms also vary considerably ; medium-sized houses require two or three bedrooms and a bathroom, and larger houses may need many more bedrooms or even dormitories and a common room. A staff rest room, cloakrooms and lavatories are essential for all but the smallest houses.

If kitchens are placed on upper floors, as is frequent in larger houses on confined sites, there should be a direct tradesmen's staircase to this room. The planning for food service may have to provide for meals in both dining-rooms and light meals in public bars, for full meals (generally lunch) in saloon bars or at snack-bar counters in saloon or lounge bars.

Figure 3 illustrates in diagram form the essential relationships of the various parts of a public house plan and stresses the points referred to above. It will be seen that the centre from which the whole building is controlled is the licensee's office, which in its turn controls the bar counters serving each of the rooms. Attached to or adjoining the bars are the lavatories for each sex. The entrances to each type of bar must be direct from the outside, but one entrance may serve two bars of similar character, such as the lounge and saloon bar. The kitchen and restaurant are here indicated as ground-floor accommodation, with club rooms or smaller dining-rooms on the first floor.

Cellars—Beer may be stored in a basement cellar, in a store-room adjoining the bars, or in the bars themselves. Wherever casks are stored, easy access for their delivery is essential. Above is a table of the sizes and capacities of casks which is useful as a guide—although casks vary in size according to the liquor contained.

Name of cask	Capacity of gallons	Extreme diameter in feet	Extreme length along stave in feet
Barrel	36	2.10	2.42
Kilderkin	18	1.70	1.81
Firkin	9	1.41	1.37
Small cask ...	6	1.15	1.30
Pin	4½	11.11	1.25

Glazed earthenware and glass-lined tanks or containers of 3½ and 6 barrel capacities are sometimes installed in houses where there is a very large consumption of draught beer. Beer for the filling of these "tanks" is delivered in bulk in container lorries. They are connected to the counter beer engines with flexible tubes similar to those used for casks.

It is most important that beer stored in casks or tanks in basement cellars should be as near the counter beer engines as possible. In most cases it should be directly below the counters, in order to reduce the rising pipe lengths to a minimum.

Cellars do not need daylight, nor is complete dryness necessary. Damp cellars appear to be cooler than very dry ones ; a constant temperature of about 75 degrees F is desirable. It is often necessary to install cooling plants to maintain temperatures about this level. Direct ventilation is usually avoided in order further to control temperature. Such ventilation as is necessary should be indirect and capable of control, and should be planned to draw air only from cool places and not from warm rooms or from warm external positions. It is frequently stated that the efficiency of the cellar plan and the storage conditions are most important factors in the trade of any house. Not only must the storage be well planned and maintained at correct temperatures, but deliveries from the brewery must be made in as easy a manner as possible. External access is generally provided in a position to which brewers' vehicles can approach without difficulty.

Pavement flaps, with or without barrel skids, usually give access to the cellar, although in some schemes vertical hoists have been installed ; when there is not a hoist, skids and steps should be arranged, the former for sliding down the casks and the latter for access. Adjoining the skids it is advantageous to have a ramp on which cases containing bottles may slide, as in many houses the number of cases containing bottled beer, spirits and mineral waters is very considerable, and much time may be gained by handling these quickly. When installing access traps for casks, the clear opening should be at least 3 ft 6 in in either direction. When skids for barrels are installed, it is desirable to fix a wood (often oak) or similar pad to break the fall of the casks when they reach the cellar floor and to prevent damage to them. The inclined planes for cases are sometimes made up of a series of rollers, and it is an advantage if these deliver on to a low platform rather than on to the floor. Cellar flaps, since they give direct access to the cellar themselves, are better placed in shaded positions to keep them cool.

Figure 4 illustrates, with essential dimensions, a typical cellar access arrangement, including the barrel skids and steps.

Cellars in basements do not require very much height, and a clear height of 6 ft 6 in is sufficient ; greater floor heights increase the length of the pipes from casks to beer engines.

The best finish for cellar walls is glazed bricks or at least bricks having a very smooth surface to give both an appearance of cleanliness and to facilitate easy cleaning. Exposed angles should have bull-nosed bricks, preferably of a very hard type—especially near any part of the cellar where casks and cases are handled. Floors should be of impervious materials and laid to falls leading to a gully or gullies so that the whole may be washed down easily and quickly.

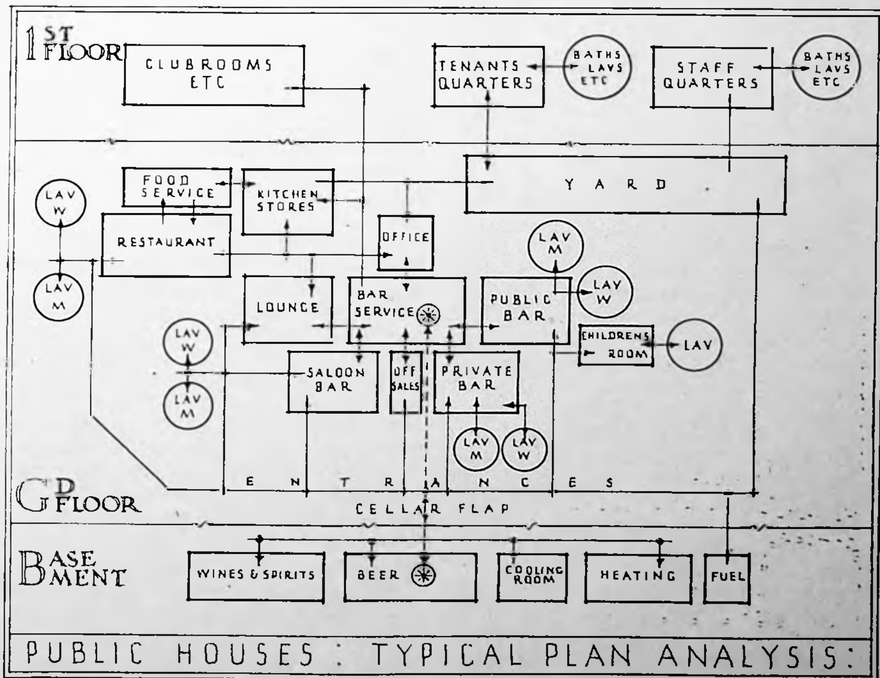

Figure 3

The cellar may comprise one large open space, but in many places a section for wines and spirits, divided from the remainder by walls or wire mesh, is required. In some cellars the actual beer storage space is also cut off, so that a cooling plant only has to operate for a limited part of the total area; such cooled spaces often have insulated walls. Various types of special cooling localised apparatus for draught beers, which do not mechanically cool the entire cellar areas, and are, therefore, worthy of consideration, are available.

Figure 5 illustrates a typical cellar plan. The heating chamber is separated from the beer cellar by specially thick walls, and in addition the fuel store is planned to form a division between the heating chamber and the wines and spirits store. The latter is separated from the main area of the cellar in which the beer, both in casks and crated bottles, and mineral waters are stored. The stillions, or cask racks, are placed as directly as possible below the bar counters to minimise the run of piping to the beer engines.

Stillions are sometimes fixed, but many authorities prefer them to be movable for cleaning down the cellar. They are frequently made of heavy timbers in lengths for several barrels, and sometimes each cask is placed on a separate barrel tilt. When basement cellars are not used, and consequently no beer engines are required, barrel tilts of various designs are usual.

Spirit Stores — The storage of spirits calls for little special equipment other than bottle racks for special storage. Spirits are in a large measure stored in the cases in which they are delivered, and a certain quantity is usually kept in cabinets or in the back fittings in the bars themselves.

Wine Stores — Wine, however, needs much greater care, especially in those houses which have a considerable better-class restaurant trade. Proper cellars often have to be constructed and care must be taken to select a position where temperatures remain constant, or may be reduced and maintained at the varying temperatures needed for each type of wine; these temperatures vary from 50 degrees to about 58 degrees F. The bottles may either be stored in brick and stone bins on metal shelves, or in one of the various types of wood and wire racks in which each bottle is separated from those adjoining. The stone bins are usually constructed with spans between supports of 3 ft to 5 ft, 1 ft 6 in to 2 ft in height, and 15 in to 18 in from back to front, although sometimes the latter dimensions are made greater to provide for two rows of bottles end to end. The wire type bins are constructed in square units approximately 4 in centre to centre in both directions, and may be built up into units of any required size; such bins will hold all normal bottles, but larger sizes, for magnums and similar specially large bottles, are also made. Bins may be single- or double-sided; single-sided racks are usually 9 in deep and double-sided 18 in (unless racks of the "French wave" type are used, when the depths are usually 12 in and 19 in). The space between faces of bins should be at least 3 ft wide for circulation. Metal bins are usually 1 ft 5 in deep, formed of steel bars on cross bars with lattice uprights.

Great care is essential in cellar planning to avoid trouble from heating chambers, and to avoid hot pipes to radiators in bars passing through cellar spaces which must be kept cool.

Ground-floor or bar level cellars from which beer is drawn direct from the cask usually have the barrels placed on wooden racks, either near floor level or about 2 ft 6 in high, or on patent cask tilts; racks or tilts at a high level assist service, although it is somewhat difficult to place casks in position. Cellars in this position must be carefully insulated, and cellars required for a row of casks against a wall should not be less than 6 ft wide, and preferably a little more.

From basement cellars two methods of lifting are used: first, beer engines which are pumps; and, secondly, pressure systems which depend on using CO_2 or air. The piping is made of various materials, such as tin-lined lead, porcelain, rubber, glass, an alloy of nickel and copper, or stainless steel; of these, glass with rubber connections is now the most general.

The pumps for beer engines may be placed on the bar or over the back bar fitting or cabinet. Pumps are usually placed in groups of two or three at intervals along the bars rather than of larger numbers together.

Hoists—It is essential to have a vertical connection between cellars and bars in all larger houses, as it saves much work in transporting casks, cases of bottles, etc., from storage to bar counters and back bar fittings. The size varies considerably according to the type of house, but 3 ft by 2 ft 3 in at least is desirable; in many, they are only large enough to carry about two crates of bottles, while in others they are very much larger for moving casks or numbers of crates at one time. It is essential that the hoists deliver, inside the counter space or into a lobby between bars, as they are likely to be used during licensed hours, apart from the fact that much of the goods to be carried are bottles of beer, wines and spirits. These hoists may be hand or power operated.

Counters—The planning of bar counters does not involve many special factors. Some bars need long counters in relation to the drinking space; others may be quite small. In public and saloon bars long counters are general, while in lounges and cocktail bars—especially where there is waiter service (at least in part)—smaller bars are usual, and in fact some rooms are even served by means of a hatchway, the last arrangement being very general in games rooms. The counters and back bar fittings must be considered jointly, as together they form the complete bar plan and equipment. As previously stated, the counter must be planned in the room so that the whole space is visible to the barman for supervision. It is usual to raise the floor within the counter space 2 in or 3 in above the general floor level to help towards control.

The space between the bar and back fitting should be at least 3 ft wide, and is better increased to a minimum of 4 ft, more especially in large bars where several persons may be serving. The bar counters are usually made about 3 ft 6 in high above the general room floor level, although some authorities suggest slightly lesser heights as more satisfactory. The bars themselves are constructed in various ways; some have little overhang of the top from the front, and others have a large overhang; equally, in some the under-counter is on the same face as the back of the top counter, but in many others the under-counter projects about 8 in. Counter tops should be from 1 ft 6 in to 1 ft 10 in wide, and may be of various materials, such as hardwood, linoleum, rubber, synthetic plastic materials (such as bakelite), or even sheet metal; the desirable factors in selection of materials for counters are resistance to damp, spirit stains and burning, and non-liability to damage glasses. The overhanging top has various advantages, especially if stools are to be used in conjunction with counters; and, moreover, the overhang assists the preservation of the bar front.

Bar fronts in better bars are frequently of veneered woodwork to match panelling, but although this may be considered more decorative, it is not very satisfactory as such fronts do not stand damage well, particularly from "stubbed-out" cigarette ends. Fronts are better of solid-framed hardwood, or faced with linoleum or rubber, with a high turn-up at the base of terrazzo, tile or metal, which receives the wear from floor washing, kicking and cigarette ends. The turn-up should be continued as a floor band round the counter, preferably about 1 ft 6 in wide, to act as an ash tray. Fronts are frequently sloped inwards to increase the toe space, and this is specially desirable if the top does not overhang the counter front. Counter fronts for bars used for the service of food often have a double top in order to form a shelf for gloves, books, ladies' handbags, etc., and sometimes a solid projection is made to form a foot-rest in conjunction with either fixed or movable seats. Fixed seats are often installed in bars serving food. Foot-rails appear to be a controversial subject; many persons

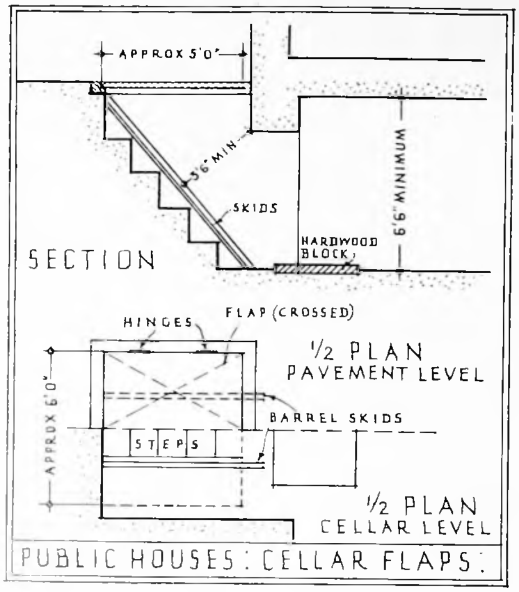

Figure 4

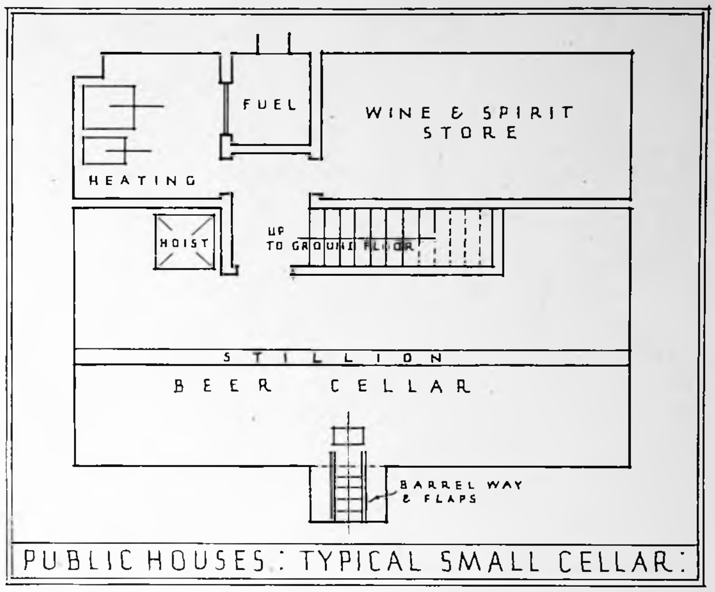

Figure 5

like a foot-rail at all bars, and if stools are regularly in use they seem very desirable. Saloon and lounge bars usually have foot-rests. Such foot-rests should be of wood or metal supported well clear of floors and counter fronts, for easy cleaning and to avoid damage to bar fronts.

The pulls of beer engines are usually fixed to the counter top, so that drip trays may be planned under the outlets at a general under-counter level. In the under-counter are placed the sinks, which are, as a rule, of metal with metal draining-boards, and in many schemes the whole of the under-counter is metal-covered ; the metal-work is carried up at the back and sides as a guard against splashing for a height of at least 8 in or 9 in. The under-counter is often projected into the service space, so as to make the washing of glasses more easy and to facilitate the placing of drip-trays under the beer pulls. The spaces not required for sinks, drip-trays, etc., are used for storage of glasses, bottled beers, minerals, etc. The portions of counter front around the beer pulls generally have to be made removable. Hot and cold water should be provided to all sinks ; a dreg sink, connected to the trap of the wash-up sink, is often installed. Some houses now install glass-washing machines, which are available in various types. Such machines provide a more hygienic method of cleaning glasses than the usual dipping in semi-dirty lukewarm water, and the space occupied is a very small part of the under-counter area.

In regard to the construction and finish of bar counters, there is much variation in type and quality according to the class of trade and the type of bar. Public bars are usually heavily constructed but inexpensive in finish, whereas saloon and private bars are often much more elaborate. A certain amount of display is needed, but this is usually confined to the back bar fittings ; the important factor throughout is quick and easy service for all customers' needs.

Figure 6 illustrates a typical bar counter section, including the space generally allowed for the back bar fittings—although in some instances these are varied to accommodate hoists, service lifts, refrigerators, etc. It should be noted that all cash is usually kept in the back bar fittings, or in cash registers placed in a similar position. The figure also shows a rail at the front of the counter top, which has certain advantages in preventing customers' clothes touching bar tops, which may be wet. Such rails may be of metal or wood, or may be formed by cutting slots in the counter top near the front edge.

Figure 7 illustrates three further types of bar counter-front sections. It should be noted that in some schemes, especially in snack bars, the counter height is sometimes reduced to as little as 3 ft above the floor ; some authorities consider this lower height to be more comfortable and essential for use in conjunction with stools. Other authorities, on the other hand, raise the counter and make use of the usual normal height stools. Snack bar counters are better increased a little in width to accommodate the customers' plates and to display food in glass cabinets.

Diagrams A and B show two counter fronts with permanent raised steps instead of footrails ; these are in many respects more comfortable for meals. Type A has a flat metal-covered step with a skirting on the main bar front, whereas Type B has a definite tray at the step level. Diagram C shows a counter with an undershelf, suitable for snack bars. Types B and C have the front sloped back to allow the customer to sit as near as possible to the counter front, while still giving ample footspace.

Back-bar Fittings—These fittings are just as important in regard to the service of the customer as the bar counters themselves, while they form that portion of the bar equipment which, being in constant view of the customer, should be treated in an orderly and pleasant manner. The fittings are often elaborate in design, although primarily they must supply large shelf spaces. The lower portion should be at least 1 ft 6 in wide and have a main table or counter top at about the height of the serving counter ; it is usually made of hardwood, as both cleanliness and resistance to wear and tear must be taken into consideration. The lowest shelf should always be lifted slightly above the floor level of the counter serving space. The shelves should be strongly constructed, for heavy loads of bottles, etc., have to be carried. The upper part of the back-bar fitting is more in the nature of display, and the lighting (which is often hidden) is usually designed to enhance that purpose The higher shelves may be narrower. and are frequently of glass and adjustable in height. These cabinets or fittings are generally fixed and planned often to form screens or divisions between bars or between bars and service spaces or the licensee's office. Sometimes doors are required to lower parts of the cabinet in preference to open shelving. Service lifts, hoists and refrigerators usually have to be planned in conjunction with these fittings and often within the area of the fitting itself, and the entire layout should be considered carefully in relation to the final appearance as seen from the public side of the bar counter.

Bar Planning—The shape of a room to be used as a bar does not

seem to be of great importance provided that the whole room may be constantly supervised by the bar-tender, but shapes that lend themselves to the provision of suitable spaces for games such as darts without interfering with the comfort of non-players, are advantageous. The areas required for each room or the comparative sizes of the rooms cannot be laid down, as variations are likely to occur according to the type of trade common to each house, apart from limitations of site and the restictions of licensing authorities. Counter lengths are also governed by the type of trade ; public and saloon bars need long counters, but lounge bars of all types need much less, and where waiter service is provided, the counter may become merely a small hatch, or a short length of screened counter.

It is desirable that customers in one type of bar should be invisible from customers in other bars and the counter and service space layout should be controlled by this requirement.

the counter fronts for the staff to reach the public areas for collection of glasses, etc.

Bars should have window areas, to ensure ample daylight, and it is usual to fill windows overlooking public thoroughfares with obscure glass to at least eye level. Window-cill level is preferably kept above the level of the backs of fixed seats or chairs. When bars overlook large private forecourts or gardens, French windows should be provided, especially if there are terraces suitable for use in warm weather and sufficient space is available for tables and chairs.

Fixed seats, usually arranged round the walls, are frequently incorporated in the planning of bars of various types. In lounge bar types, where there is a generous provision of chairs and tables, the layout should be based on the use of small square or circular tables about 2 ft overall with both arm and small chairs.

The majority of bars need a fireplace even when central heating is provided. Coal fires are considered a popular and desirable type of auxiliary heating. The placing of fireplaces often adds to planning complications in bars, especially when there are large dining and club rooms on the floor above the general bars, since the fire should be placed away from the counters, out of the way of any draught from entrance doorways, and at the same time be available for a crowd of customers and out of the way of such games as darts. Central heating is provided generally in all better-class houses of recent construction.

Folding screens are often installed between bars or between spaces which are used for different purposes at various times of day, as, for example, to separate part of a lounge to form a dining-room where there is a special lunch trade, but little demand for meals in the evening when the space is more advantageously used as a lounge. Folding partitions are also useful to reduce the size of rooms at times when the bars are less crowded, as half-empty bars create a bad impression.

Entrances to Bars—Some authorities insist in double exit doors, particularly in buildings licensed for music and dancing, but otherwise single doors are generally preferred. Single doors are preferable if doors open inwards only, but some authorities again require double swing doors, or double doors opening outwards. All such double exit doors used only occasionally must be provided with automatic panic bolts.

It is usual to hang doors with floor springs and to avoid latches, unless the situation dictates otherwise. It is desirable to form vestibules at entrances, especially in windy or exposed positions. Wide vestibules with collapsible metal gates are often used to serve two bars, mainly, it would seem, to avoid placing two doors close together on an elevation, but when this scheme is adopted the adjoining

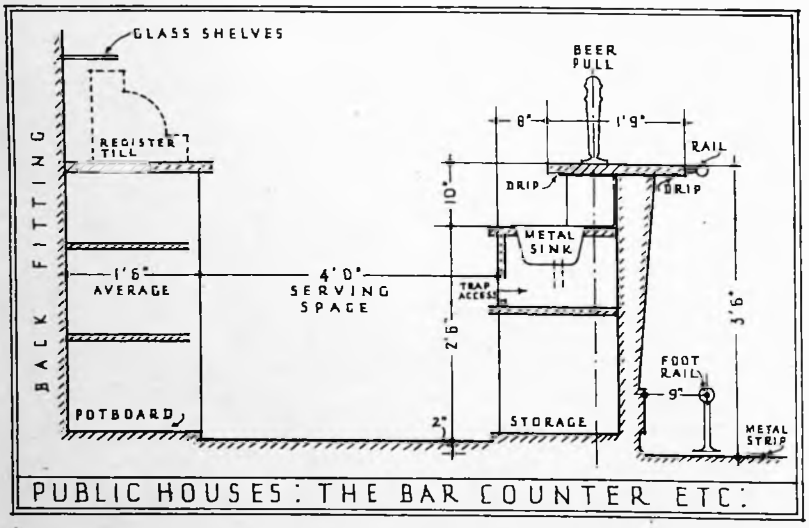

Figure 6

Figure 8 illustrates two typical public house plans, with the bars arranged on two quite distinct types of layout. In Type A the main service area is centralised with bars surrounding it, whereas in Type B the service space is arranged in one continuous length, with the bars placed mainly on one side only. The service space in Type A is more compact, but customers can to a small extent see from bar to bar across the service spaces, although the double-sided back fitting makes a fairly adequate screen. Bars of the type shown in diagram B almost entirely prevent this.

The divisions between the bars are often screens of panelling with an access door on the service side, so that staff may, if they wish, pass from bar to bar without entering the counter space. Many of these screens are solid up to a height of about 7 ft, with the upper part glazed. Wicket gates and flaps should be provided in

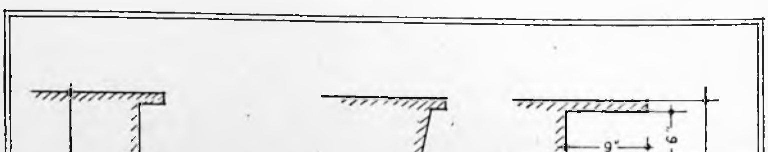

Figure 7

bars should be planned to serve a similar class of customers ; thus, a public bar and a saloon lounge should not be grouped together.

Revolving doors, although useful for restaurants and hotels, are seldom used for entrances to bars ; they are generally unpopular, and they need considerable space, especially if the doors have to be inset in the frontage to permit of external doors or gates to close the opening completely in non-licensed hours. It is desirable that doors be about 3 ft wide in the clear, and have the upper parts glazed, or have at least inspection panels, particularly when double swing doors are used. Proper mat-well sinkings should be provided at all entrances, and, within reason, these should be made as large as possible.

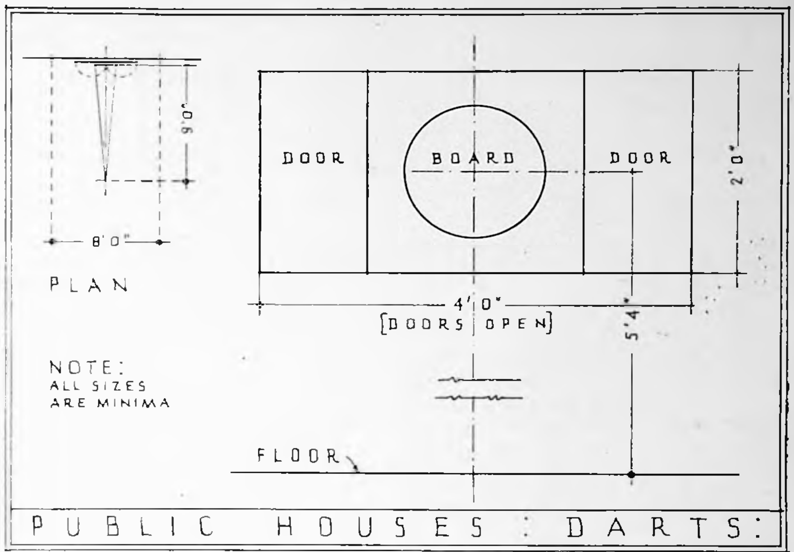

Figure 9

Games—Many of the games played in public houses, such as table skittles, shove-halfpenny and dominoes, do not require provision other than suitable tables ; but other games, such as darts, should be given careful consideration when planning the bar layout. Darts require a board fixed in a definite position and a cabinet with doors to house the board, either fixed to the wall or incorporated in the panelling. The placing of the darts board must permit of ample space for the neces-

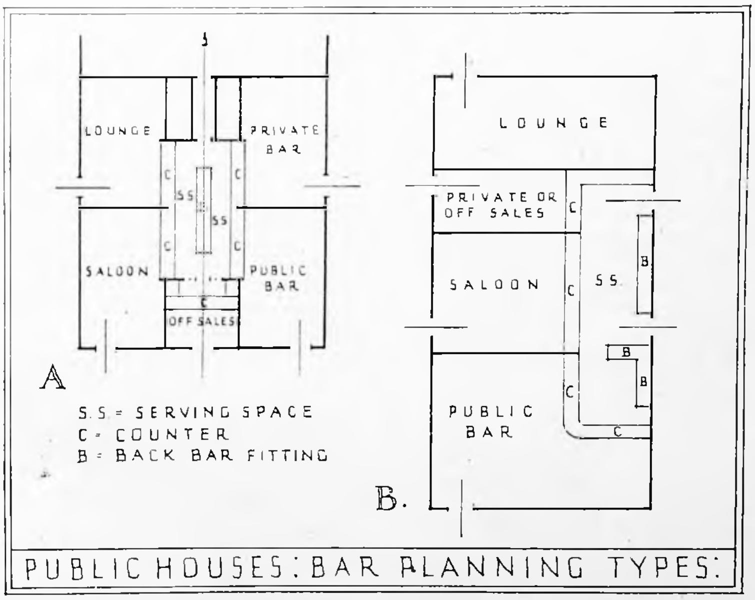

Figure 8

sary 9 ft long "throw," and be placed where players cannot cause any danger to other customers ; gangways and doorways should be carefully avoided.

Figure 9 illustrates a typical dart-board cabinet, together with the more important general dimensions. It is becoming very general to enclose the board in a box with doors which, when opened, provide a blackboard surface for scoring. The centre of the board should not be less than 4 ft from any doorway or gangway space, and preferably rather more for reasons of safety, but it may be placed as near as 2 ft 6 in to a side wall. Proper provision should be made for artificial lighting of the board.

Billiards tables are provided in many houses, although there appears to be less demand in recent years—with the result that the space is more often used for lounges. (See section : " Community Centres.")

Many houses in suburban or rural districts provide for a variety of outdoor games, such as quoits, bowls and tennis, the requirements of which are given in the section " Recreation."

Some brewery companies and licensees like to provide separate games rooms, so that customers likely to remain for long periods may use these rooms without disturbance from customers calling at the house for a short time only. The planning of games rooms calls for no special comment except that no very great length of bar counter is required. Club rooms also require little special planning. Service is provided either from an adjoining lobby connected by lift, if on an upper floor, to the main service bars, or by a hatch to the latter if on the ground floor.

Music and dancing licences are often required for bars and other rooms in public houses. The requirements of the plan are generally not affected except in regard to the usual sizes and planning of staircases and exits.

Off-licence—This department is also called " Jug and Bottle " and " Off-Sales." There are two general schemes of providing the necessary accommodation, first, as a separate building, and secondly as a room or bar between or adjoining other bars. The separate building is useful only when there is likely to be a large outside trade, as it necessitates someone in charge during all permitted hours of sale—someone who cannot be available to help in other bars, as is the case when off-sales are attached to other bars. Separate buildings do, however, permit of the provision of external display windows. Whenever possible some showcases for display should be provided externally, and internally display cases are essential in all schemes. A short counter should be provided, and apart from this the main equipment needed is a large amount of shelving for storage of bottles, or easy access to such storage space.

When the off-sales are limited in amount a small bar adjoining others in the house, but screened from them, permits the off-sales counter to be part of the main bar counter of the house, and service is provided by the bartenders of the other bars.

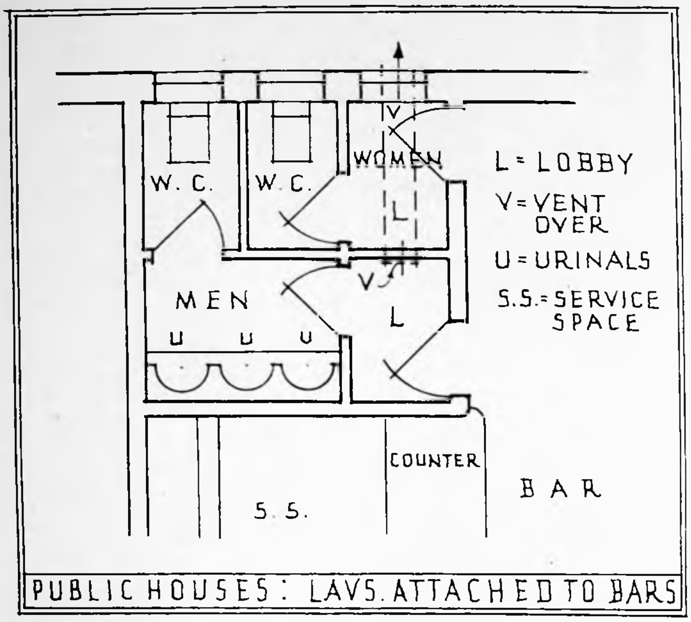

Figure 10

Lavatories—Lavatories should be provided for each bar and for each sex. In some schemes two bars of a similar type may use the same lavatories, approached from a common lobby planned between them. The planning of the lavatories often proves to be one of the greatest difficulties of the scheme, more especially when it is insisted that the entrances should be planned off each bar with the doors in view of the service space. Sometimes the authorities will permit of lavatories being approached from the entrance lobbies to bars, but many insist that they should be approached from the bars themselves. The provision of adequate ventilated lobbies at the approaches is essential, although often difficult to plan.

One W.C. for each sex is usually sufficient for all except the largest bars, and in addition some urinal space for men. The latter should provide for not less than three persons, an allowance which should be increased considerably for large bars. Some districts still favour external approach (especially for accommodation for men) in conjunction with public bars, but whenever possible internal approach is considered preferable. It is usual to tile lavatories and W.C.s to a height of at least 7 ft ; all equipment must be selected to withstand constant hard wear, and all surfaces should be capable of easy cleaning.

The ventilation of approach or cut-off lobbies can often be achieved by means of false ceilings over entrances or other lobbies. The detailed planning of public house lavatories is similar to the planning of lavatories in other buildings to which the public have access, and information is given in the section "Lavatories ; Public and Communal." General minimum dimensions for W.C.s are 2 ft 9 in by 5 ft 3 in, while urinals should be based on an allowance of 2 ft centre to centre.

Figure 10 illustrates a typical plan of sanitary accommodation attached to a bar ; doors leading to the accommodation for each sex are placed in the bar adjoining the counter, but as far from it as the plan will permit. The lobby to the men's lavatory is ventilated over that to the women's lavatory by means of a duct to the open air. Adequate light and good ventilation are most essential in all schemes. Lavatory basins should be provided in lavatories attached to bars catering for higher classes of trade, especially when there is restaurant accommodation.

Licensee's Accommodation—The living accommodation for both the licensee and the staff is covered by ordinary domestic planning, and therefore does not call for special comment in this section, except that in some houses, especially smaller ones in country districts, a living-room is planned in close conjunction with the bars to assist supervision, and to allow the licensee to sit in comfort when the bars are not busy.

When service of food, either snacks or full meals, is likely, adequate space should be allowed in kitchens in addition to any normal needs of the licensee and the staff. When dining-rooms are planned sufficient servery space adjoining the room to be served is essential, and if the dining-room is on a different floor level, suitable lifts must be installed, preferably in duplicate ; two small lifts are usually the most satisfactory, and are likely to be more efficient than one larger one. When current is available, lifts should be electrically, rather than manually, operated.

28. *Holiday Hostels*

The Problem—In the future there will, undoubtedly, be an increasing demand for hostels in rural districts to accommodate tourists, especially walkers and cyclists, at minimum prices. Many examples of this type of building exist both on the Continent and in the United States of America; these are run under the auspices of such organisations as the various alpine clubs, touring and walking clubs and cycling societies. In America a number of these buildings have been established in the State reservations and national parks and are run and financed by the governing authorities. The type of people to be catered for are mainly those not able to afford the cost of hotel accommodation, who wish to travel "light" and "rough," and who are prepared to cater and partially attend to their own wants, with provision of the bare necessities of sleeping and eating facilities, and do not demand any attendance whatsoever from servants, except possibly a limited amount of cooking. The buildings to meet such a demand are generally only in use for week-ends and during the summer months, and even during the periods of use are only occupied by tourists for the few hours between early evening and after breakfast. Such hostels are usually in charge of a resident warden (sometimes a married couple), who looks after the general cleaning, and will also cook for visitors if required. Hostels should have accommodation for both sexes—each separately provided for, but rooms for married couples are not usually allowed for in the plan. The essentials which the building and its equipment must give are, first, a bed for which a mattress and blankets are provided, but each visitor brings or hires from the warden sheets or a sheet sleeping bag; secondly, facilities for cooking both by the visitors themselves, and communally by the warden; thirdly, sanitary accommodation, including baths, when the water supply permits; fourthly, a common room in which visitors may spend evenings and eat meals, and lastly a suite of rooms or flat for the warden, who is also, generally, provided with a small office. The accommodation may be planned on one or two floors, as is suggested in Figure 1. Types A and B are, in essence, one-story buildings with a suite of rooms for the warden on an upper floor, but Type C has two floors in order that the sleeping and sanitary accommodation may be duplicated, each floor being confined to one sex, usually men on the ground floor and women on the first floor.

Site Considerations—The site for such a hostel has few special requirements. It should be pleasant, quiet, away from main roads, and be so situated that the prospect is good and the aspect such that the common room may be towards the south, or, better, west, as the use and enjoyment of the room is mainly in the evening. The dormitories or bedrooms are best with an easterly aspect. A large site is usually unnecessary, and may involve upkeep time which the warden could not undertake, and which hostels could not carry, as the intention is primarily accommodation at minimum expenditure. Care should be taken when selecting a site that a water supply will be obtainable either from mains or from wells or other sources which can meet the demands of maximum numbers of visitors during summer, and, consequently, dry months. Public sewers are an advantage, but often not available, and suitable falls and similar facilities should be considered for a sewage disposal system of an adequate capacity. Electricity or gas for lighting and cooking are very advantageous, but are frequently not available in the most pleasant or desirable districts where this type of hostel is most likely to be appreciated and required. If gas or electricity are not available, oil is the most general illuminant, and is also a very suitable fuel for rapid cooking. Heating is necessary in many hostels, particularly those in exposed or high districts, while most hostels have an open fireplace, preferably for burning wood, in the common room.

It is desirable that the buildings should be soundly built and well designed, and not of a makeshift character. Such hostels should not spoil local amenities, nor need be designed out of sympathy with local surroundings. Local materials should be used where possible, and when this is not possible only those of a suitable character should be substituted. The buildings should be simply designed throughout and internally be well built of materials which will provide the maximum of cleanliness and hard wear with the minimum of maintenance. The building may well be of a semi-permanent nature so long as it has a reasonably long life without undue upkeep cost.

Size of Buildings—The total accommodation at any particular hostel is largely dependent on the anticipated number of visitors to each district, but it does not seem desirable that the numbers should exceed figures of forty-five to fifty in any one scheme,

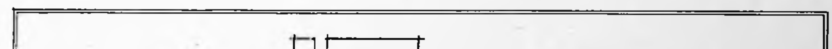

Figure 1

unless the warden has assistance. The visitors do much of the work themselves, but the general cleaning and supervision is entirely in the hands of the warden, assisted, if he is married, by his wife.

General Planning—Figure 1 illustrates three typical hostel analysis plans providing generally the accommodation previously discussed. Type A is a single-story building, with only the warden's quarters on the first floor. Type A demands the lay-out of a building so that the common room should have a westerly aspect, with the entrance at the centre on the east side and the two dormitories on a north and south axis. This lay-out provides an east aspect for a long side of both dormitories, which is most desirable. Dormitories are best as wings, so that cross ventilation is available, as the accommodation in floor space has to be reduced to the minimum. In this type only one kitchen is shown for the use of both visitors and the warden, although these are generally separate, as some visitors prefer to save the cost of paying for food to be cooked. The common room is placed so that the walls are exposed, although windows are not necessary on the north wall. A terrace is provided on the south of the common room, approached directly from it by french casement windows. This plan places the dormitories for each sex, together with the sanitary accommodation on each side of the central hall.

Type B is also mainly one story, and is based on a site with a different aspect; the entrance is on the north, the common room has only one main wall exposed, and this is towards the south again with a terrace as in Type A. The dormitories are also on each side of the main hall, and turned to take as much advantage of east light as is possible on the site. In this scheme separate drying rooms are provided for the clothes of each sex, and also the sanitary accommodation is approached from a lobby and not directly from the dormitories as in the other two types. If the corridor is introduced as shown, service from the kitchens to the common room creates a cross circulation, but in this type of building the corridor is not strictly necessary, and can be omitted, so that all the rooms lead directly from the common room. The corridor has the one small advantage of cutting off more satisfactorily kitchen smells penetrating to the common room, as meals are likely to be cooked during long periods in the evening, as visitors may arrive at all times.

Type C is a two-story building with the women's dormitory placed over the one for male guests, thus leaving a wing with three open walls for the common room; this arrangement permits a maximum of sunshine in this room, which is used both in early morning and in the evening. Terraces are placed on both south and west frontages of the common room. Both Types B and C are compact plans from the point of view of water and drainage services. In each type similar accommodation is provided for the warden, comprising an office, a sitting-room, a bedroom and the warden's kitchen, which, as already stated, is the general kitchen for the building, and where he or she will cook his or her own food.

Common Room—This room is usually the only sitting-room provided, and therefore serves visitors of both sexes for meals, for writing, and as a general lounge. A floor area of at least 10 sq. ft. per person, based on the maximum bed accommodation, is usual. The room should be rectangular rather than square with a fireplace, if possible, on a short side away from the room door and any doors to kitchens. Some windows are best in the form of french casements leading to a terrace or garden, which may be used both for sitting and for open-air meals. Some cross ventilation is desirable. Heating other than an open fire is considered by some to be unnecessary, as these hostels are not likely to be extensively used in winter time; but in some districts many visitors may stay during spring and autumn, when heating is desirable, and assists in keeping the building dry and fit for the immediate use of unexpected guests. The planning of the room should, to some extent, permit of setting aside parts of the room for meals, and also for the fireside area for sitting, while still leaving uninterrupted passageways to the terrace from the room entrance doors from the main hall. The plan shown in Figure 2 A shows a scheme in which the room is divided in two definite parts, one end for meals with the doors to the members' and warden's kitchen adjoining, and the other end with the fireplace usable as a sitting space; the main circulation from the hall to the terrace thus does not impede either use of the room. Figure 2 B shows a scheme with a cross corridor, connecting the hall to other rooms, cut off from the rooms by piers and, if required, curtains or screens; the room is again divided into two main parts, but access to the kitchens from the tables necessitates crossing the through circulation, which in rush times may be a disadvantage. As the rooms are large and likely to be occupied by many persons at one time, they are better if the ceiling height is raised above a minimum of 8 ft, which may often be achieved by carrying up the room into the roof space, if this part of the building is planned as a single story.

The furnishing and decoration should be plain, simple and strong. Some fixed wall seats for use with dining tables or adjoining the fireplace assist in saving space, but other fixed furniture should be avoided in the common room, as this may often be cleared for games, dancing and other amusements. The general aim of the designer should be to produce a scheme which is pleasant, cheerful, easily cleaned, and will stand fairly heavy wear and tear. Natural untreated wood should be considered for finishes and furniture, as this will withstand hard wear and can be washed and scrubbed with the minimum of labour. A certain amount of wall space, which may be provided in the common room, should be allowed for the display of district maps; these may well form permanent wall decorations, or may be arranged on rollers.

Kitchens—Meals may be provided in either of two ways; firstly, by

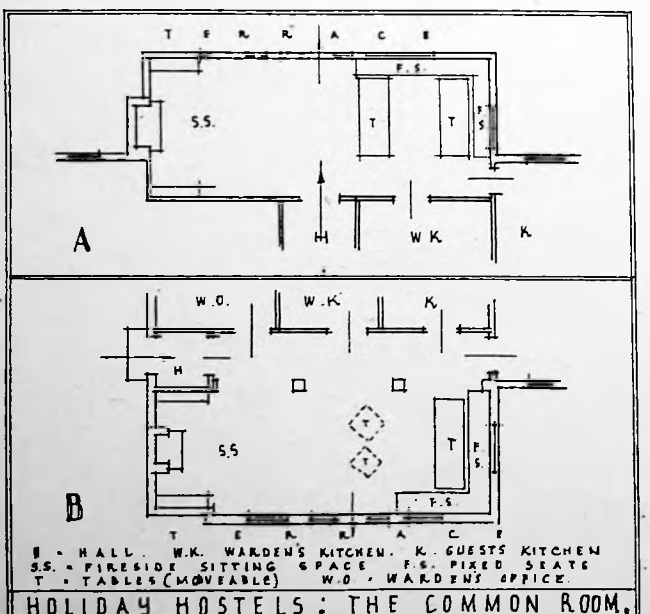

Figure 2

the warden supplying and cooking all food, and secondly by the members bringing food with them, or purchasing it from the warden and cooking it themselves. All work such as service, washing up dirty china, etc., is usually carried out by the visitors. It is therefore general to have two kitchens in each building, in order that guests may work apart from the warden.

Members' Kitchen—The main requirements of this room are the provision of sufficient apparatus for cooking, washing up, and also storage for utensils, cutlery and china for the maximum capacity of the hostel. The cooking required is usually of a very simple nature, which can be carried out on small table cookers, either gas, electric, or oil fueled, providing a grill for toast, chops, etc., and boiling rings above for the remainder of the cooking. If these small cookers are planned well apart, at, say, 4 ft from centre to centre, and placed on a long continuous table, the space between is then sufficient for the needs of food preparation; this table top should be about 3 ft above the floor level, and may be continued round the room to form draining boards to the sinks and extra table area for utensils and preparation. Below the table tops should be drawers for cutlery, spoons and forks, and cupboards for the larger utensils. Spaces between the cupboards and beneath the table tops are useful when users are standing up to the tables for working, and also for the placing of garbage pails. As many other cupboards as can be accommodated comfortably are needed for storage of china, glass and other essential equipment for cooking and eating. Figure 3 illustrates a typical lay-out of a members' kitchen in plan and elevation, showing the main points of arrangement of fittings and cupboards. Cookers should be provided on a basis of at least one for every 10 beds, and sinks in the proportion of one to every 15 beds of the total capacity of the hostel. The cookers and sinks should each be grouped together to reduce the costs of services such as supply pipes and drainage, but each fitting must allow sufficient working space around it. Direct access to the common room is usual, but as meals may be served over a long period, every effort must be made to provide good ventilation in such a manner that the heat and smell does not make the common room uncomfortable for other members who are waiting or who have already eaten their meals. The area of the members' kitchen can be based on an allowance of about 4 sq. ft. per person of the total accommodation, as not all visitors cook their own meals, and all meals are not taken at one time; also it can be reckoned that one person is often likely to do the actual cooking for two or more guests.

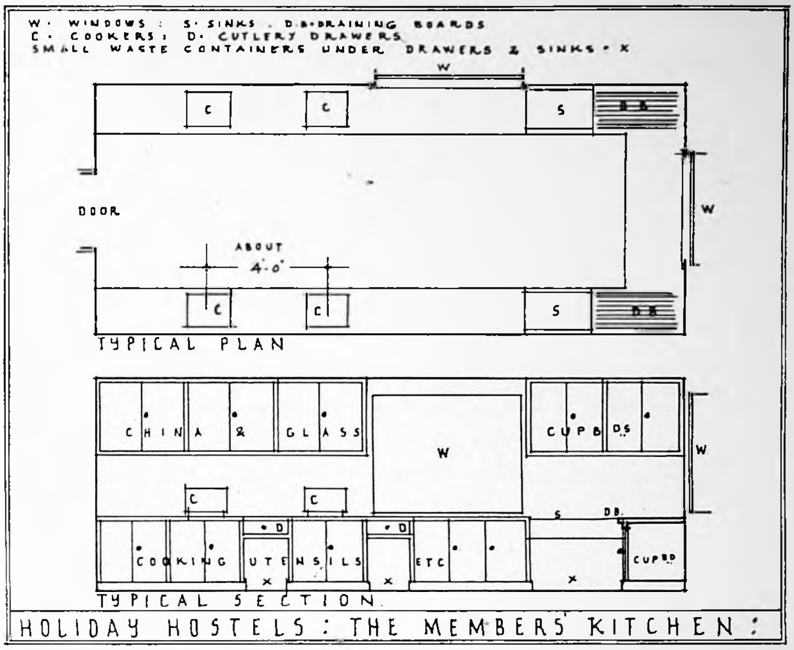

Figure 3

Warden's Kitchen—This room should adjoin the members' kitchen, as it has to serve the same part of the common room, and close proximity helps the distribution of services. An area approximately the same as, or rather larger than that allowed for the members' kitchen is needed, as the cooking is likely to be more elaborate and for larger numbers at any one time. Again plenty of storage space is necessary, together with a fairly large larder, particularly in districts where shops do not deliver frequently and proportionately larger food stocks must be held. A large cooker with ovens, rings and grill is required, a large sink with good draining boards, space for table, and when suitable power or fuel is available a refrigerator is extremely useful, due to the difficulty of assessing the number of visitors likely to stay on any particular night. It is a convenience for the warden if the boiler room supplying heating and hot water, and also fuel stores, are easily accessible from the warden's kitchen without having to go into the open air. A tradesmen's entrance directly to this kitchen avoids taking deliveries through the building to larders or stores.

Sleeping Accommodation—It is general to provide this in the form of dormitories (one for each sex), in order to reduce the necessary area required to a minimum. In larger schemes, two-tier bunks may be used instead of beds, thus halving the floor area required for any given number of persons. Beds should be based on the use of standard spring mattresses 6 ft 6 in long by 2 ft 6 in or 2 ft 9 in wide, supported on wooden or metal framing. Spaces between bunks should be at least 3 ft 6 in and preferably about 5 ft, as this has to serve four persons for dressing, etc., and, therefore, a good spacing of four bed units is 10 or 11 ft from walls to centre of partitions or from centre to centre of partitions. The central corridor-way need not be more than 4 ft, but should not be less than 3 ft 6 in, thus giving a total internal width for the dormitory of about 17 ft if beds are placed on two sides, forming units for eight beds of 17 ft by 10 or 11 ft. A window should be placed between the pairs of bunks to ensure adequate ventilation. Partitions between the bed units are best carried up to the ceiling. Dormitories should be at least 8 ft high and are better slightly more, otherwise the upper bunk is very near the ceiling and the cubic air content per bunk is unsatisfactory. The windows should be as wide as the bed spacing will permit and should extend to the ceiling to be sure of free air for the occupants of top bunks. The partitions between two bunks may be formed of plywood or building board, but this should be reasonably strong to stand up to rough usage and involve a minimum of upkeep; thicker partitions tend to localise noise, an important matter in dormitories. In addition to the actual beds or bunks, very little furniture is required and what is necessary can be incorporated in built-in fittings. A small locker is desirable for each person and these may be provided satisfactorily between the bunk heads under the windowsill level in sets of two or four as necessary; the guests usually have very little baggage, all of which is carried in a rucksack, and therefore the locker size is governed by providing sufficient space for a rucksack

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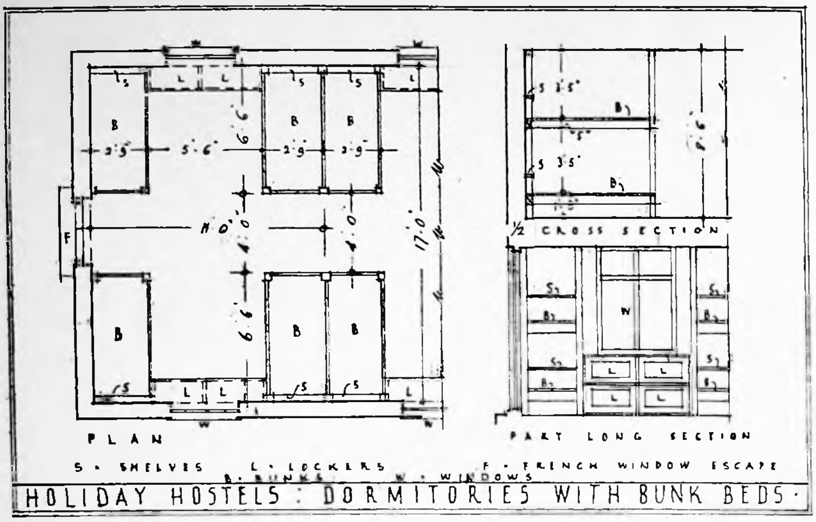


Figure 4

and its contents. Other than the lockers, the only necessary fittings are one or two clothes pegs per person, which may be attached to the bunk ends. Figure 4 illustrates a typical layout in plan and section of the bunks, from which it should be noted that the lowest bunk is kept about 1 ft 3 in from the floor. The dimensions given allow an area of 93½ sq. ft. for four bunks, which seems to be very inadequate for health reasons, especially if the ceiling level allows a height of only 8 ft 6 in, as the volume is only slightly more than 200 cubic feet per person. Increased dimensions are, therefore, desirable, since there is a likelihood of persons spending complete holidays, sleeping at various hostels based on similar dimensions. It should also be noted that a door is provided at the end of the main passageway as an emergency means of escape.

As an alternative to the open or semi-open dormitory type of sleeping accommodation, cubicles may be provided ; these are formed by dividing the dormitory space either by fixed partitions, curtains or a combination of the two as shown on Figure 5. Such cubicles are usually planned either for single beds or for two bunks ; this type of accommodation is likely to be preferred by women visitors owing to increased privacy. Partitions need only be 7 ft high, thus assisting the through ventilation ; the end curtains being at the same height, also assist cross ventilation. The dimensions may be reduced, if each cubicle is to accommodate one person only, to 5 ft 6 in by 6 ft 6 in with a centre passage only 3 ft wide. The end curtains may be hung on rods between the fixed partitions which should also serve to strengthen the latter laterally.

Sanitary Accommodation — This should be provided in two groups, one attached to each dormitory and thus serving one sex. Direct access to lavatories is desirable from the sleeping quarters, but W.C.s should be adequately cut off as they may be used by comparatively large numbers of persons. W.C.s should be provided at the rate of at least one to eight persons with a minimum of two ; and lavatory basins at the rate of one to six persons. A larger proportion of sanitary equipment is more satisfactory. Baths should be provided, when an adequate water supply is available, in the proportion of one to eight or ten persons. Shower baths, occupy, with dressing space, less area than ordinary baths ; women, however, generally dislike showers. Shower baths are occupied for shorter periods per person and, therefore, may be used by a larger number of persons in a given time. A proper hot-water supply should be provided to all lavatory basins unless water is exceptionally scarce.

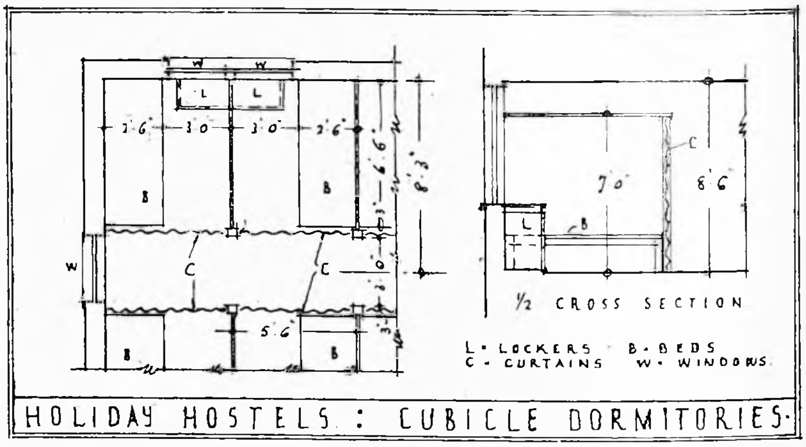


Figure 5

Drying Room—It is important that provision be made for drying visitors' clothes, as these are often very wet after a day's walking and have to be dry for the wearer to continue on the following morning. The room should be equipped with heating pipes above which clothes may be hung on hooks and hangers. Good ventilation is important for this room, so that the vapour formed may be removed and consequently the room should be on an external wall, and have, if possible, cross ventilation. A floor area of about one square foot per person should be allowed.

Warden's Accommodation—This accommodation should comprise an office, a sitting-room, a bedroom and a bathroom, in addition to the kitchen already discussed. The office should be on the ground floor and needs only a very small area ; it should be readily accessible from the main entrance door and also from the warden's kitchen. The remainder of the rooms are probably best arranged as a flat on the first floor which permits of complete separation from the public rooms and dormitories. The rooms do not need to be large as frequently the warden may be a single person, but they must provide pleasant, comfortable accommodation, as it is the warden's permanent home and not occasionally occupied by passing visitors like the remainder of the building.

Bicycles—Such hostels as these may be used by cyclists as well as pedestrians and therefore it is desirable to provide some covered, and better, totally enclosed cycle accommodation. This may be simply fitted with racks to hold one wheel placed at about 1 ft 7 in centre to centre, as shown in detail in the section on " Schools."

29. *Holiday Camps*

Introduction—It is certain that the future will see a steady growth of communal holiday institutions of various types. Among these are youth hostels, (see section 28), and may be considered as catering in a specialised way for the walking or cycling tourist, and the holiday camps, which have developed at many coastal places for the purpose of providing accommodation for visitors over periods of one to three or four weeks. The holiday camp has, up to the moment, provided for seaside summer holidays, and its growth has increased mainly by reason of the numerous facilities provided within an inclusive charge, and because food, housing and service is more satisfactory, and in many instances less costly, than normal "rooms" or "apartments" in seaside towns. As the camps are organised for large numbers many communal facilities, such as cafes, lounges, dance and games rooms, swimming baths and bathing beach huts, are rendered economical, and the costs of operation are almost always included in the weekly charges for housing and food.

The increase of this type of establishment is likely to continue, on account of the extension of the principle of paid holidays for all workers, which is gradually coming into being. There are, also, signs of a movement to set up such camps, aided or supported by local authorities or by other bodies interested in national fitness, so that the dwellers in the more crowded parts of our industrial towns may be enabled to go to seaside or country at nominal rates; various private, semi-public and charitable bodies are assisting in the development of such movements in order to provide holidays at very low costs.

The type of housing, furnishings, service and amount of amusements must vary according to the proposed weekly charges and different price grades are necessary in separate camps to cater for the needs of different sections of the community.

Accommodation in each grade must provide for families of various sizes, and also for single men and women who find that the holiday camp provides a communal life quite unavailable in "lodgings."

One of the most important factors is the inclusion of as much of the holiday costs as possible in the one primary charge; thus the avoidance of "extras," which are often the cause of much irritation to holiday-makers, is attained, although some camps charge extra for such services as baths, early morning tea and even afternoon tea. The extent of the amusements provided free must again be limited by the price paid, but by the centralised organisation of large camps economies will no doubt permit of increased facilities.

In some camps visitors are expected to clean their sleeping rooms, make beds, etc., but in others all the work is done for the visitors by the staff as in an hotel.

Most camps provide some shopping facilities for their guests, so that tobacco, sweets, postcards, etc., are available without leaving the camp; in some examples quite elaborate shops offer a wide range of goods, and incidentally assist the profits of the undertaking or the reduction of general charges. Some of the camps have additional amusement facilities available at extra charges.

Situation of Sites—Up to the present holiday camps appear to have been organised only at the seaside, but there seems to be no reason why similar camps should not be planned in such places as the Lake District, the moors and mountains, or in the vicinity of other natural attractions. There does, however, appear to be a possibility that similar camps, which are, in fact, moderate priced hotels, might be placed nearer to the larger towns; for instance, in the London Green Belt, for use at week-ends all the year round, and for longer holidays for those who cannot afford long journeys. It would seem that in such situations most of the facilities of the seaside camps are available, such as clean fresh air, semi-open air-life, games facilities and rambles with the one exception, of course, of the seashore and sea-bathing; these may to some extent be replaced by sand-pits and a swimming-pool.

Licences—A normal licence for the sale of alcoholic liquor cannot as a rule be obtained for a holiday camp, although certain similar buildings (when called hotels) have been granted licence. The grant of a licence necessitates serving to all, other than members of the camp, and this may not be desired. Some camps prefer to be without a licence of any sort, while others make their visitors members of a camp club and obtain thereby a club licence, a scheme which eliminates many difficulties from the management point of view.

General Analysis—The camp scheme should be considered in two main groups, first, the accommodation which has to be roofed and protected from the weather, such as the communal rooms and sleeping accommodation; secondly, the accommodation, mainly recreational, which is provided in the open air.

The first group has certain main sub-divisions, which are general rooms, such as lounges, games rooms, club rooms; rooms for food preparation and service; guests' sleeping accommodation, together with sanitary and bath units; staff accommodation; and, lastly, administration rooms. Garages are provided in some camps, while others find there is no demand for this provision; it does, however, seem that there is likely to arise—and, in fact, to some extent it already exists—a special type of holiday camp for motorists and the users of motor-caravans.

The essential grouping keeps all

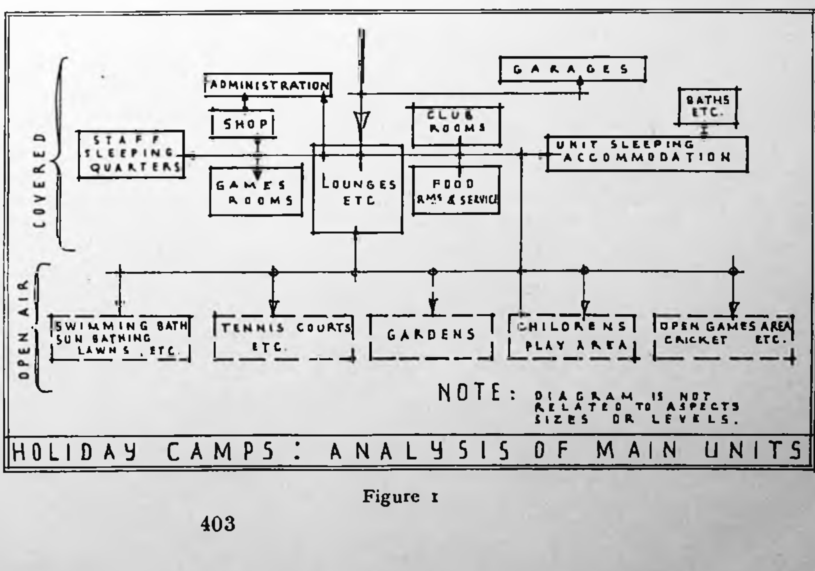


Figure 1

general rooms together and to these should lead the main approaches from the road, gardens and beach, if any. Near the main road-entrance should be placed the rooms needed for administration, the number and size of which will vary mainly with the size of the camp. In smaller schemes the shop should be attached to the offices, but this may not always be desirable. All rooms where food service is needed, such as dining-rooms, lounges where teas may be served, club rooms and bars, must be grouped with the kitchens. Sleeping accommodation should be isolated away from noisy public rooms as much as possible, and the main bathroom and lavatory accommodation attached to the sleeping units, although some lavatory facilities should be grouped with public rooms. (See Figure 1.)

Sizes of Schemes—The sizes of holiday camp schemes vary considerably; some provide for 30 to 50 persons, whereas others may cater for several thousands. In the smaller types the individual or family sleeping accommodation is likely to be substantially the same as that needed for large camps, but the communal provisions, in the form of public rooms and open-air facilities, are likely to be very different. Small camps may have one general public room used for meals and recreation; the larger camps will need separate dining-rooms and several lounges and games rooms, in addition to shops and licensed club rooms. Such extensive camps will certainly need garage accommodation, with a repair shop, petrol pumps, etc.

Some camps have been built in the vicinity of existing buildings, such as country houses and farms. In these cases the existing buildings have generally been used as part of the administration, staff or communal accommodation, with new sleeping accommodation, often in tents in the first instance and, ultimately, in "chalets," or cabins, added.

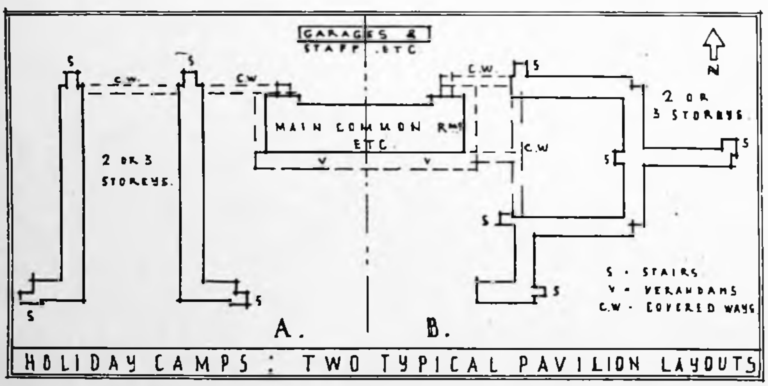


Figure 2

By-laws, etc—Buildings for holiday camps are controlled by the normal building by-laws and by the Town and Country Planning Acts. In addition, certain parts of the Public Health Acts and Model By-laws make special reference to "Tents, Vans, Sheds and Similar Structures" which may be presumed to control at least some of the buildings of the nature under consideration in this series; the more important references are to provision of proper and adequate sanitation, water supply and refuse disposal. Certain direct references are made to movable dwellings and camping grounds which involve licensing by local authorities. There is also a reference to the conduct of camps, to litter, and to noise and musical instruments. Such regulations, or implied regulations, may be considered as applying to holiday camps expressly designed and built for the purpose, whether they take the form of permanent, or semi-permanent, or temporary buildings.

Sites—Certain matters in regard to the relation of sites should be borne in mind; level sites reduce the cost of formation of tennis courts and other recreation grounds, but small variations can be handled easily when a plan is based on a number of separate buildings. Aspect should have careful consideration in planning both the communal and sleeping-rooms, but in resort situations, such as at the seaside, prospect may be deemed of greater importance than aspect, particularly as the buildings are used most in the summer time and much of the visitors' time is likely to be spent in the open air. Sites with water and electricity available are to be preferred—except when the scheme is large enough to warrant the cost of sinking wells and generating power. Drainage should be considered very carefully; sewage has to be disposed of quickly and easily and, if a public system is not available, additional and suitable land is necessary for sewage disposal. Small camps may be equipped with earth or chemical closets, bearing in mind by-laws in regard to distances from wells, cleansing, approaches, etc. But for larger schemes disposal systems with septic tanks or with complete rotary distributor systems are needed; these systems involve the allocation of an adequate area of site, which should be well separated and screened from the camp by means of walls, close fences, trees or hedges. Proximity to towns or villages is not important if adequate transport is available, or if it can be provided by arrangement; with larger schemes, in fact, some advantage may accrue from being distant from towns or villages, since the amusements and shopping facilities provided by the camp owners are better patronised and thus justify capital expenditure.

As already mentioned, there seems little reason why holiday camps should be confined to seaside districts; although they may be self-contained as far as recreation is concerned, it does seem desirable that there should be natural attractions, such as woods, lakes, rivers or mountains, around the site chosen. Since there is likely to be a continuing increase in the use of motor vehicles, holiday camp sites should have reasonably good road approaches.

Layout Types—Many different types of layout have been used for holiday camps. The communal accommodation in all types is assembled in central blocks, around which the sleeping units are grouped. The sleeping accommodation may take the form of pavilions, blocks of buildings containing many bedrooms, suites of bedrooms, or "chalets" or huts, separate or in small groups. Figure 2 illustrates two typical layout plans based on the use of large blocks or pavilions for bedrooms. These pavilions may be single-story buildings, or two or even more floors high and they may be single- or double-sided (rooms back to back); in the latter type it is almost essential that the main axis of the blocks should be from north to south, as rooms facing due north are undesirable. As already suggested, north aspect may have to be considered not necessarily as the direction away from the sea or other view, but when prospect is thought to

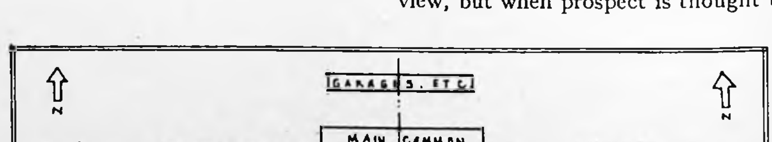


Figure 3

be of greater importance than aspect.

A large area of site adjacent to the main building should be kept open and available as a recreation space as indicated on Figures 2 and 3. If a pavilion-type layout is adopted, the distance of blocks from one another must be controlled by the height of the building. In all cases an adequate amount of garden between blocks not only adds to the appearance, but also increases privacy, especially when balconies or covered porches attached to adjoining blocks face one another. By continuity of balconies or covered porches on a pavilion type scheme, together with connecting covered ways, as indicated in Figure 2, a limited amount of protection may be given to guests in wet weather; protection of this type is very difficult to provide in the detached chalet type of plan shown in Figure 3. The advantages of covered connections giving access to sanitary accommodation are particularly worthy of careful consideration; at the same time it may be borne in mind that the covered connecting ways which pass close to each sleeping room reduce privacy; but these covered ways are not likely to be used much in fine weather.

When pavilion blocks are grouped round gardens or tennis courts, as suggested in Diagram B of Figure 2, certain rooms obtain direct views of the sea—if this is on the lower side (south) of the diagram—but in Diagram A no direct view is provided.

Figure 3 illustrates two typical layouts where huts or chalets are used. Type A is less monotonous than Type B, and has a greater feeling of spaciousness. These huts may be single-room units or blocks of rooms back to back and two or more to each frontage.

The pavilion-type plans appear to give a much more pleasant layout and better general architectural appearance, but if they are taken to two or three stories stronger construction is involved, and more soundproof construction must be provided if there is to be the same amount of privacy as is obtained in a plan using the individual hut or chalet accommodation.

Reception—Visitors to holiday camps arrive both by railway and by road. At the busy season all letting periods are based on a week commencing on Saturday afternoon and finishing on the following Saturday morning. In many camps arrival must be after a fixed time such as 4 or 5 p.m., and in certain instances special trains are organised to run from centres of population to arrive about 5 p.m. Similarly camps often desire guests to vacate rooms not later than 10 a.m. on the day of departure in order to leave as much time as possible for the staff to clean rooms between each letting. In consequence of the fixed arrival times and special train schedules a large proportion of new visitors have to be dealt with at the reception office in a very short period of time.

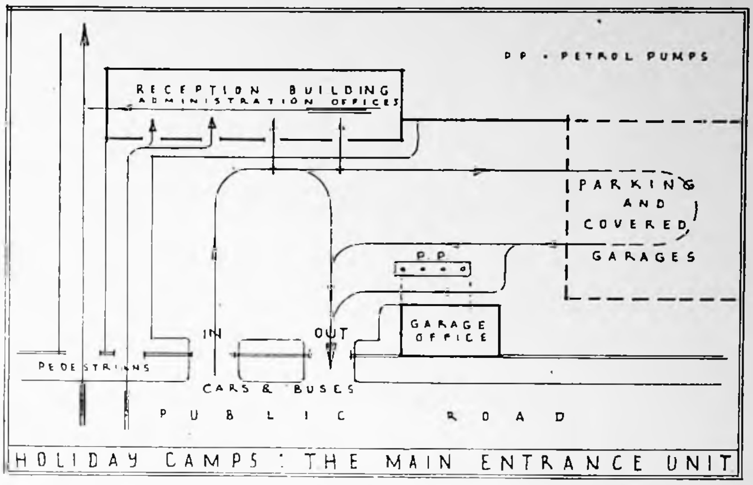


Figure 4

At the reception office, on arrival, guests will have their sleeping accommodation allotted to them. They usually will have to pay the week's charges in advance, and they will be issued with club badges and general information. Camp authorities usually ask for a deposit when the booking for accommodation is made, and the balance is payable on arrival at the camp. In most camps club badges are given to all visitors in order that they may use and be served in the rooms having a club licence.

A number of guests, and in fact an increasing number, arrive in cars, for which accommodation must be provided. Certain of the existing camps have found that sleeping accommodation for 1,000 guests may require motor-car space for as many as 200 cars; the more expensive the camp the greater is likely to be the proportion of private vehicles. Some covered car-parking space should be provided, for which a charge may be made, and it may be found that a few visitors will like and, are prepared to pay for, lock-up garages. If camps are in very exposed positions and are likely to be open to receive visitors in the early spring or late autumn, more covered and partially enclosed space is necessary than for those camps open only in the midsummer months. Covered space is desirable for 10 to 25 per cent of the motor-car accommodation—according to the class of visitor catered for at any particular camp.

Car parks and garages should not be planned in a position where their use is disturbing to any sleeping accommodation and, in addition, should occupy a position where the entrances and exits are capable of control. Larger camps will justify the installation of petrol pumps, and even a small garage building for sale of smaller accessories and for carrying out minor repairs; these may be operated by the camp management or may be let on a lease to other management.

Figure 4 illustrates the general planning of a main entrance and approaches to a larger type of camp. The reception buildings which incorporate the management offices of the camp may be a separate building or may form part of the main communal building of the camp. In the figure the reception unit is set back from the main road to allow for vehicles to drive up to the doors to set down passengers and luggage; also to allow vehicles such as charabancs to wait to pick up visitors without obstructing the main road. It should be noted that space for pedestrian approach is provided separately from the vehicles; this leads directly into the camp—and may form a main axis—but passes the reception building so that the latter exercises some control over all persons entering or leaving the site. Car parking and garage space is kept to one side of the main vehicular entrance and exit so that these need not be obstructed, and the petrol pumps and service building are placed away from all other buildings but on the route of all traffic leaving the parking space on its way to the main road.

The reception office itself should be long and fairly generous in area to accommodate the very large numbers who arrive in a short space of time. Long counters are essential and there must be adequate space for luggage as well as for the guests themselves. One or more offices are needed in conjunction with the reception office. The equipment of the reception office is largely a matter of the individual needs of each management. Some camps use the same building as the shop for the sale of various goods to visitors and some use it for the display and distribution of letters, the sale of photographs and similar purposes, but other camps restrict the use of the room or building to management of bookings, cashier, etc., only.

Figure 5 illustrates in diagrammatic form the essential detail requirements of the reception offices for a large camp. There are several entrances from the main approach to the camp. These lead into a long room with a full-length counter which may be divided into sections for clerks dealing with reservations of various groups of

guests, for cashiers, general information, etc., as considered necessary. The public space then leads directly to the camp, by separate doors to avoid cross traffic. Luggage is often handled mainly by the guests themselves, but in some camps the staff assists guests with luggage and shows them to their sleeping accommodation. In the scheme shown in Figure 5 various management offices are provided behind the main counter, with the manager's office arranged centrally for easy and rapid access to all rooms as well as to the public counter itself. The sizes needed for these rooms are entirely dependent on the numbers to be accommodated in the camp, although in some schemes there may be central management offices elsewhere, controlling a number of camps, where much of the general control and buying takes place : these reduce the accommodation for such purposes needed at the camp itself.

Figure 5 also shows direct access from the camp through a waiting room to the manager's office, and a waiting room attached to the public space. In this example the shops are adjacent to the management rooms and are placed each side of the main public circulation space to the camp. Large camps need considerable space for shops and kiosks ; these may be operated by the management or, alternatively, sub-let. Storage space for files, stationery and literature should be available in the shops and also in the offices. Figure 5 also shows a safe or small strong-room, without external walls, attached to the accounts or cashier's room. It should be borne in mind that large sums of money may have to be kept on the premises from Saturday until Monday, and that there are also daily takings from general sales, bars and lounges for which a safe may be required.

Dining-rooms—It is essential that dining-rooms for holiday camps should have an area sufficient to seat the maximum number of visitors which the camp can accommodate at one time, as having two services for meals appears to be very unpopular. The floor area should be based on an allowance of at least 10 super ft per person up to the maximum number ; this permits of more generous spacing at times other than peak periods, such as the month of August. Separate tables for each party are preferred in all but the cheapest types of camps. Consequently it is wisest to arrange a layout based on tables for two persons, which may be put together to form units for parties of any size ; some camps, however, prefer to use tables for four persons as a minimum number. Full information and table-spacing diagrams for dining-rooms and restaurants are given in the section on "Hotels" ; this information applies equally to the present subject. Tables for two persons should be 2 ft 6 in by 2 ft 4 in as a minimum, which may be taken as the basic unit for table layouts. As stated in various other sections of this book, rooms requiring food service should be rectangular on plan, with the service rooms placed along one long side, thus reducing the distance of the tables furthest from the service room to a minimum.

Spans of dining-rooms should be as large as possible, in order to avoid supports obstructing the floor area ; if spans are fairly large, light should be provided from roof lights or clerestory windows for the parts of the room away from the outside walls, as the constant use of artificial light is costly in buildings of this character.

Direct top-light is better avoided, as in summer time the cumulative heat in the room due to the direct rays of the sun is likely to be uncomfortable ; clerestory and similar high side-lighting is much more satisfactory, as the direct sunlight entering the room is limited ; windows may be made to open more easily than top-lights, thus providing ventilation to the rooms at a high level near the centre of the floor space. Figure 6 illustrates four typical cross-sections suitable for the large spans necessary for dining-rooms, together with methods of lighting and insulation against heat. Diagram A is based on a large clear span for the whole width of the room and on the use of a Belfast or similar truss. A flat ceiling is provided over the whole area of the dining-room ; high side-light from windows over the verandah on the one side, and over the kitchen and service rooms on the other, permit of fairly good light distribution over the whole floor area.

Diagram B also has a clear floor area, but the trusses cut through the ceiling, which, since two rows of high-level windows are provided, is at two levels.

In diagram C part of the room only has a high ceiling level, and the remainder a lower level similar to that of surrounding verandahs and rooms ; this type necessitates a certain number of supporting piers or stanchions placed in the room.

Diagram D shows a further type of clear span roof with a flat ceiling over the whole area of the room. This type has large windows, occupying the full height of the room, and provided by the omission of the covered verandah on one side. These windows permit of much more direct sunlight to enter the room, but this may be considered a disadvantage by some people ; the room in midsummer may be excessively hot.

The outside walls of the room should be given as much glass area as possible. Visitors in holiday camps will usually enter the dining-room directly from the gardens—which probably provide the nearest approach from the sleeping and games accommodation—so that a large number of doorways is desirable ; in most camps there is a rush to meals the moment they are announced, and unless there are numerous entrances to the dining-room, congestion becomes acute. Doors are best in the form of wide pairs opening outwards ; not so much for reasons of escape as for the sake of keeping the floor space of the room clear and because, so arranged, they are more draught-proof in inclement weather. Terraces or covered verandahs should adjoin or surround as much of the dining-room as possible. Such terraces are congregation places for guests before and after meals ; in exposed positions movable glazed wind-screens surrounding the verandahs are a great advantage, especially as the verandahs may be used not only as "foyer" space to the dining-room, but also as additional lounge space for serving afternoon tea. Dining-rooms should have ample external open space round one long and one short side at least.

In view of the large area of these rooms, care should be taken not to have ceilings or roofs at too low a level. Consideration should be given to insulation of the roof to avoid excessive heat (or cold) in the rooms ; open roofs with only roofing material without an inner ceiling are apt to be uncomfortable in extreme weather and are somewhat unattractive in appearance. Artificial lighting should be borne in mind when considering the

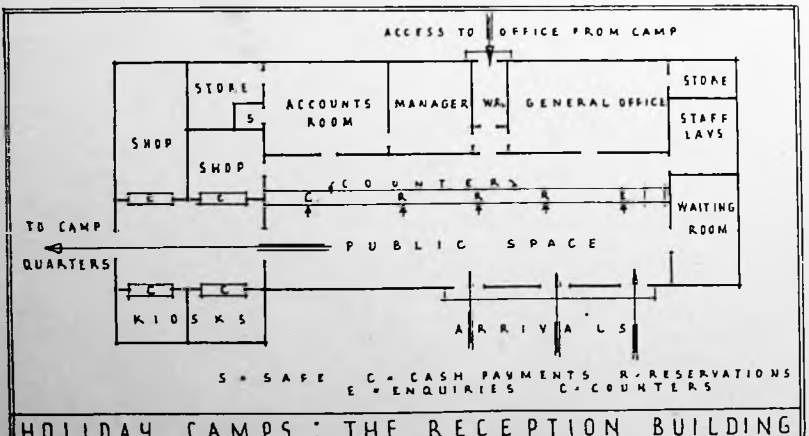


Figure 5

interior of these rooms, as a fairly high intensity, coupled with even distribution, is very important.

Lounges—As previously suggested, it is desirable in all camps with accommodation for over 300 persons that lounges and ballrooms or other rooms used for the general entertainment of guests should be separate from dining-rooms ; clearing the tables quickly after an evening meal, so that the room may be used for dancing or concerts, involves a considerable amount of labour, which is rapidly followed by the replacement of furniture ready for breakfast. If the dining-room is the only large recreation room, there is very little space available for the entertainment of guests on a wet day.

The total area provided for lounges, games rooms, etc., should be at least

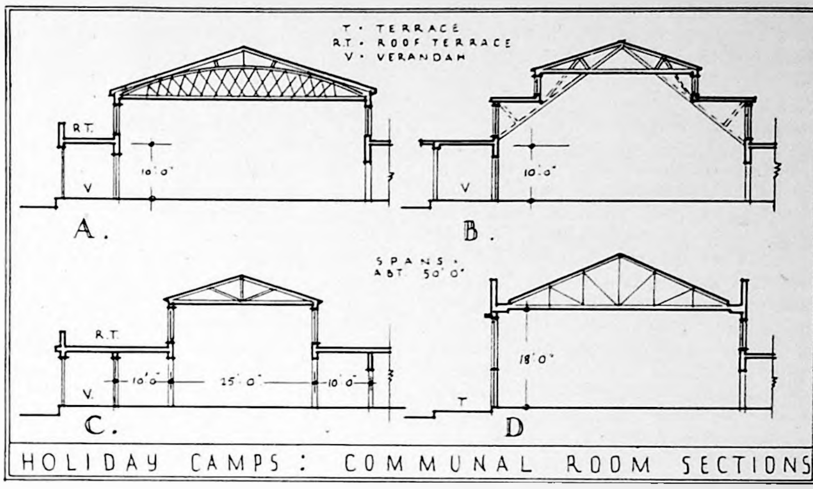


Figure 6

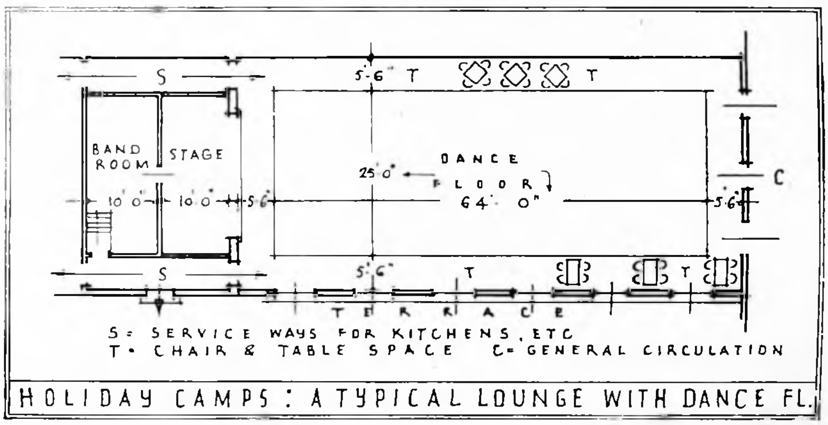


Figure 7

10 sq. ft. for every person up to the camp's maximum, an allowance which may be increased with advantage if it is considered that cost will permit additional space for these purposes. Certain games rooms, such as billiard rooms, may make additional revenue, and thus justify their capital cost apart from general expenditure on communal rooms.

The main room required is a large one in which there is sufficient space to assemble almost the whole population of the camp for concerts, sing-songs, dances and similar entertainments. Frequently this room is used for the service of teas and in some instances alcoholic refreshment is also available—served either at bars or at tables—arranged round a clear space used for dancing. Lounges and other public rooms must be spacious and sections similar to those suggested for dining-rooms in Figure 6 should be adopted. Large glass areas, overlooking the gardens, should form the outer walls ; terraces and covered verandahs opening from the public rooms as additional lounge space are very desirable. A good proportion of the window area should be capable of opening to provide, on occasion, a semi-open-air appearance to the rooms and to add to the general effect and comfort on summer evenings.

In the main lounge, especially in large camps, a permanent stage for use at concerts, sing-songs and for a dance band, is desirable. As the floor of the room is flat the stage should be raised at least 3 ft 6 in above the general floor level if required for stage performances, although 14 in to 18 in may be sufficient for dance band purposes. Curtains and a properly equipped stage are only necessary in very large camps where cabaret and professional performances are likely to be given. To accommodate a small dance band the stage should have an area of at least 80 sq. ft. for four performers, with an addition of 10 sq. ft. per person over the initial four persons.

In large camps dressing-rooms may be needed for artists, and in other schemes at least a small band room, having an area of about 100 sq. ft., is a usual requirement ; dressing-rooms should not be less than 60 sq. ft. for one person and rooms to be shared should be proportionately larger.

The area for dancing should be about 12 sq. ft. per couple, but this is often reduced greatly, and a figure as low as 8 sq. ft. is used ; it is unlikely that a dancing area for more than 50 per cent of the total camp numbers at any one time will be needed. It is advantageous to place the stage at the end of the room, rather than on a long side, which is usual for dance bands, since it is likely to be used for concerts and similar uses.

Figure 7 shows a typical combined concert and ballroom for a camp. Alternative ballrooms are given in the section on "Hotels". Tables are usually needed round the dance floor proper, and for this purpose a space at least 5 ft 6 in—which is sufficient only for a single row of tables seating four persons—should be provided. Care should be taken to plan the room in such a way that quick and easy service for light refreshments during dances and for afternoon tea is available.

In addition to the general lounge, which may also serve as concert and dance hall, at least one other room must be furnished as a general lounge. In large camps the ballroom may be a special room, but in smaller camps this separation is unlikely, so that a quieter room, in which visitors who wish to read or talk quietly may sit, is essential. A separate reading and writing room will probably not be needed.

Club Rooms—Many camps provide club rooms, which are merely general lounges where alcoholic liquor is served, this arrangement separating the service of such drinks from the general lounge. Sometimes these rooms are equipped with bars and counters ; in other schemes waiter service only is provided. When bars are provided, table space, in addition to counter stools, is essential, as some guests may stay in the rooms for long periods. Larger camps are likely to find that several small club rooms are preferred to one very large room, as a more intimate atmosphere may thus be created easily. The counters or dispense rooms will need very complete equipment, exactly as provided in similar rooms in hotels or public

houses. Suitable storage space for these rooms is needed, and if draught beers are to be sold a cellar is desirable; precautions must be taken to obtain correct temperatures for beer storage.

Billiard Rooms—Most larger camps are likely to provide billiard rooms. Charges for use of the tables are generally made separately, and not included in visitors' inclusive charges. Billiard rooms, it is understood—if not excessively large—pay for themselves adequately, especially if included among the camp's club licensed rooms. Full-size billiard tables are essential; they measure approximately 12 ft 8 in by 6 ft 8 in, to which must be added a minimum of 6 ft surrounding space on all sides—except that 6 ft is sufficient between any two tables. A diagram of billiard room table spacing is given in the section on "Community Centres."

Indoor Recreations—Provision must be made for indoor recreation, apart from dancing, particularly for wet days. Consequently, space for table tennis and darts is usually provided in public rooms or in special games rooms. Tables for table tennis vary considerably in size, but plans should allow for full-size tables 9 ft by 5 ft, with at least 5 ft between tables side by side and 10 ft between end and end, but these spaces may with advantage be increased considerably. Special care should be taken to provide adequate lighting both for day and night play in all recreation rooms. In larger or high-class camps, where the costs may well be justified, special courts or rooms are necessary for badminton and squash rackets. Information about the space needed for these two games has already been given in the sections on "Community Centres" and "Recreation."

Card Rooms—A separate room is an advantage, since the general lounges and club rooms are apt to be somewhat noisy. Card rooms should be planned on a unit as illustrated in Figure 8. Tables should be 2 ft 6 in or 3 ft square, with at least 1 ft 6 in on all sides for chairs; gangways space between chairs should be at least 2 ft wide and should be increased to at least 3 ft for some of the gangways in the room.

Service Rooms—A little food will probably have to be served in some of the public rooms, in addition to the main dining-room. Apart from food service, drinks, both alcoholic and soft, are likely to be needed in lounges and ballrooms, even if no meals, such as afternoon tea, are served except in the dining-room proper. Consequently, all communal rooms where service is needed must be grouped together as much as possible and so planned to avoid service circulations meeting or crossing guest circulations. Certain rooms, such as club rooms or bars, however, may be isolated, since they do not require constant communication with kitchens and other service rooms, and may be restocked from the main storage from day to day at times unlikely to interfere with the comfort of guests.

In some types of holiday camps the dining-room services are based on a cafeteria or self-service principle, and such a system may be considered quite satisfactory for camps where very moderate charges are to be made; it is doubtful, however, whether self-service can be operated if the number of visitors exceeds four hundred, as there is likely to be too much congestion at the service counters. If self-service is adopted longer service counters and consequently more service room floor area is needed than when waiter service is provided. Kitchens and service rooms should be based on serving "table d'hôte" meals with a limited number of alternative dishes. A floor area of approximately half the area of the dining-room should be sufficient for the kitchens and all ancillary rooms. The amount of storage space needed is likely to vary considerably, depending on the proximity of markets and the frequency at which deliveries are obtainable.

The circulations needed in the kitchens and service rooms should be considered very carefully when planning these rooms. The two important circulations are, first, the passage of the food itself from the point of delivery through the preparation and cooking to the servery counters and, secondly, the waiters' circulation with food and china between the servery and the dining-room tables.

The delivery entrance should provide ample forecourt space for large vehicles drawing up to the doorway and turning; a forecourt or yard which can be enclosed or otherwise screened from general view is most desirable, as a certain amount of untidiness, due to empty containers, dustbins, etc., cannot always be avoided. Ample space is needed at the entrance for handling, checking and weighing bulk deliveries before the goods are taken to the main storerooms. The latter (except those for the bulk storage of dry goods) should be grouped together, and should be related closely to the kitchen. Any refrigerated storage provided for goods such as dairy produce, meat and fish should be kept together. Vegetable storage and the vegetable preparation space should be placed adjoining.

The circulation in the servery should be arranged so that the waiter enters the serving space and passes the wash-up for china and glass, the cold counter, the hot counter and still room (in that order), and can then return to the dining-room by a separate door. As all meals are included in the charge to visitors, no checking is needed, except for chargeable extras, such as soft or alcoholic drinks. Considerable detailed information on the planning and equipment of kitchens and service rooms, which in general applies equally to holiday camp kitchens, has already been given in various other sections of this book. Ample daylight is most desirable and a cool aspect should be chosen for windows and for any roof lighting introduced. A limited amount of extract ventilation to eliminate the penetration of the smell of cooking to the dining-room should be provided.

Grouped with the kitchen accommodation should be a staff dining-room. This may also have to serve as a staff lounge, unless there is a room for the latter purpose attached to the staff sleeping accommodation.

Boiler Room—It is often convenient to attach the boiler room to the kitchen group, which is likely to be the main user of steam and hot water. The communal baths and the bulk of the lavatories may also be placed in the main building to avoid the cost of providing long rows of hot water service piping to reach blocks planned on other parts of the site; this question will be discussed later.

Linen Store—A large room is needed for storage and control of all linen for the camp and, for convenience of supplies to the dining-room and for supervision, it is advantageous that this should be placed near the main service entrance. It must be large enough for storage of all linen needed for the camp, and also have space for the staff to sort, repair and issue supplies. Access from the sleeping accommodation without having to pass through the kitchen is essential as on certain days large quantities of linen are handled and inconvenience would be caused if the staff passed through the kitchen or other service rooms with loads of linen. A counter should be provided so that the general staff does not have access to the linen racks.

Sleeping Accommodation—The types of sleeping accommodation have to be varied to meet different needs. Some camps provide chiefly rooms with two beds, which are used for married couples, or have to be shared by two single persons; the idea of sharing with a stranger is unpopular,

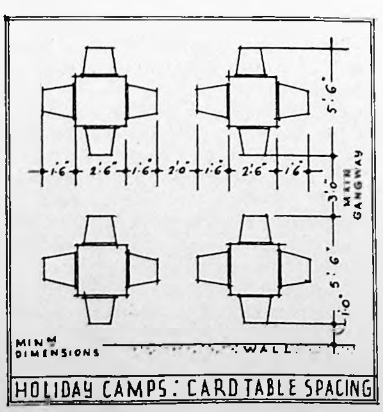


Figure 8

therefore some single rooms are essential and a fairly generous proportion is desirable. There is a considerable demand for groups of rooms, more especially one double room with one or two single rooms adjoining, for family use. The maximum of privacy for each person, couple or family is the desirable aim and the most difficult factor to provide satisfactorily. Single rooms should have a floor area of at least 65 sq. ft., and double rooms not less than 90 to 100 sq. ft.; these areas are not only desirable for health, but the necessary furniture cannot be accommodated in less space. The furniture provided usually consists of only the barest necessities, comprising one or two single beds; double beds should be avoided, as they limit the use of the rooms and involve the provision of two types of bed linen, one for single and one for double beds, a combined dressing-table-chest-of-drawers with mirror attached or on the wall above it (or over the lavatory basin), a wardrobe or curtained hanging space for clothes, where luggage may also be placed, and one chair per person, the last often being of a camp folding armchair type, which can be used also on the verandahs or in the gardens. It is desirable that bedrooms should be 8 ft high, but some authorities may permit the use of lower ceilings or roofs for at least part of the area of the room.

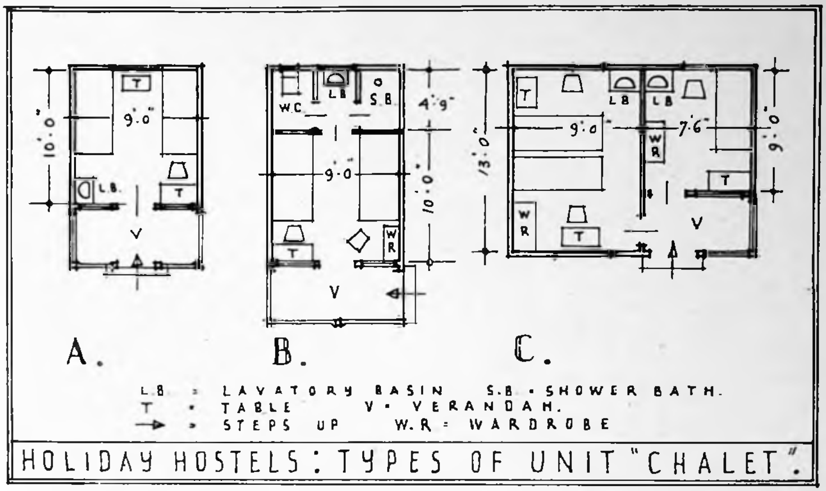


Figure 9

"Chalet" Types—Figure 9 illustrates various types of bedroom plans based on the independent "chalet" or hutment type of sleeping accommodation. Diagram A shows the smallest type of double room desirable; in front is a verandah from which the room is approached. The room has a glazed door with opening side lights at the entrance end and a window on the opposite end. A lavatory basin is provided, although cold water only may be available—as will be discussed later.

Diagram B shows a more elaborate type with a W.C. and shower bath attached for the sole use of the occupants of the room; this type is not often used and is much more costly than the other types.

Diagram C gives a unit of a double and a single room which is likely to be in frequent demand; this again has a verandah which is shared by the two rooms.

Verandahs are desirably attached to each "chalet" for use as a semi-private sitting space and as a shelter in bad weather; in addition they provide a protection to the room when the door is open. Verandahs are frequently made too small and should not be less than 4 ft wide; deck chairs are about 3 ft 8 in long without leg rests and cannot be used with comfort in a space less than 6 ft long; a width of 4 ft permits the use of folding camp armchairs of the type so often provided in the bedrooms.

When a chalet system is adopted for sleeping accommodation it is usual to place the chalets about 5 ft apart in order to isolate them and reduce the penetration of sound. It is advantageous to place the chalets in rows facing the same direction, thus retaining a similar aspect for all of them; this layout also adds to privacy as verandahs and entrance doors to chalets do not face one another. The rows of chalets must be spaced far enough apart to provide an access path, not less than 6 ft wide, separated from the verandahs by grass and/or flower beds to assist privacy; the spacing between the fronts of one row and the backs of the next should not be less than about 15 ft. Access paths should be constructed of hard materials such as paving or tarmac, which keep clean and dry quickly in wet weather. Artificial lighting should be provided.

The actual construction of the chalets is outside our scope, but it may be noted that light construction with timber framing is frequently used, covered externally with plaster, asbestos, timber, etc., with roofs covered with similar materials. Resistance to fire and cost of upkeep, together with the length of life, should be considered carefully in the selection of materials and types of construction.

The sanitary accommodation for chalet types should be grouped together for a number of chalets and placed in an inconspicuous position; the subject of sanitation is discussed in greater detail later.

Pavilion Types—As previously stated, there are both advantages and disadvantages in the selection of pavilion blocks as opposed to individual chalets. Chalets probably give more privacy, with less penetration of noise. But the wide spacing and longer paths needed for chalet schemes are not economical in space. Continuous covered ways for access in wet weather are more easily provided in pavilion type plans, construction is probably more economical and the appearance may be better because grouping is easier and there is no repetition of very small units.

Figure 10 illustrates two typical arrangements of pavilion-type sleeping accommodation together with the sanitary units attached to them. Both of the types shown are based on a main north and south axis with the rooms facing both to the east and west. If the aspect is changed so that the main axis is east to west, the double-sided plan is undesirable as certain rooms would have a northerly aspect.

The plan shown in Diagram A may be either an independent block or unit with the possibility of approach by a covered way at one end, whereas the plan in Diagram B has a series of units interspaced on each side of a covered way. The main differences indicated by the plans are the placing of the sanitary units. It is desirable that some sanitary accommodation should be planned within 200 ft of all sleeping rooms or units in order to be available for night use without the necessity of guests having to go to the main buildings, where the bulk of the sanitary accommodation is often provided. Diagram A suggests grouping the lavatories at the end and in the centre of the block; this division being needed only if the block is very long. The central lavatories are approached from a covered way, and if both those for men and for women are placed here in shorter length units, the doors should be kept as far apart as possible. If all the lavatories for a unit are grouped together as in Diagram B, access is better planned from different sides under each covered way or verandah, as indicated in the diagram, rather than from the ends—unless the verandah is carried round as in Type A, involving extra cost. These lavatory units may in some schemes include bath rooms with either shower or tub baths and also lavatory basins, although the latter are unnecessary if each room has its own basin. If hot water is to be provided, lavatory basins may be needed in the lavatory blocks as well as in the rooms. The latter would probably have cold water only and to facilitate hot pipe-runs in such a scheme as shown in

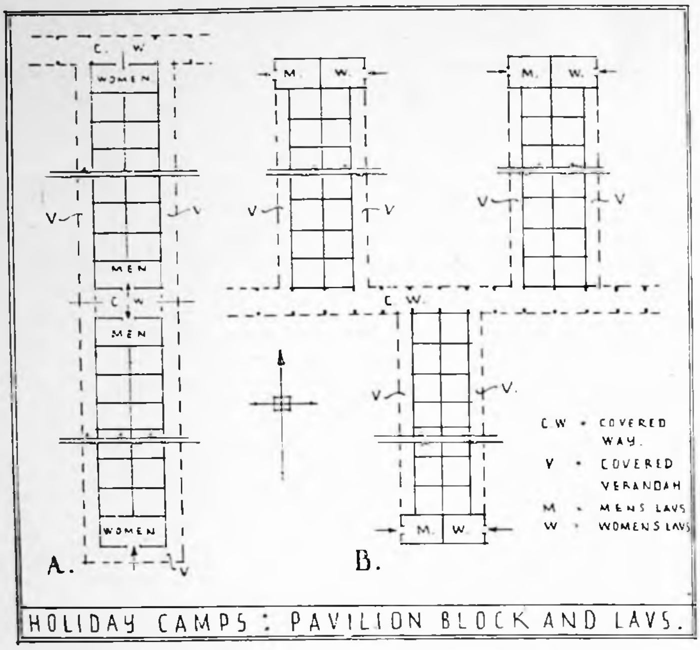


Figure 10

Diagram B it may be found advantageous to place the lavatory units adjoining the main covered way, beneath which a pipe duct could be formed.

Figure 11 illustrates two typical detail plans of pavilion-type sleeping units. Diagram A provides for double-bed units on one side of the block and single-bed units on the other side, so arranged that suites of one double- and one single-bedded room may be formed for family occupation. Diagram B shows all rooms of the same size, each equipped with two beds. Verandahs are desirable although they may not always be strictly necessary—especially in a plan such as in Diagram A, where the verandah might be confined to the side on which the double rooms are placed.

It may be found that some units of accommodation, such as one double room with two single rooms attached, may be provided more easily and economically in the chalet type than in the pavilion type of plan.

The room sizes may be the same as suggested for similar needs in chalet type plans, for the furnishing will again comprise only bare necessities.

In pavilion types, in addition to the entrance doors, windows should be provided on the front external wall; no other wall is available for the purpose and reliance cannot be placed on ventilation solely by means of doors with fanlights over.

If it is considered desirable to provide hot-water basins in the bedrooms for camps with a clientele paying higher prices, the pavilion type of plan lends itself more readily, since the pipe-length may be less and much more of the pipe-runs are insulated within the building. It may be considered worth while to build the centre division as two walls, thus forming a duct for all pipes and services for the full length of the pavilion unit so that all the pipes are readily accessible. This separation also assists in the reductions of noise between rooms.

Methods of light construction similar to those suggested for chalets may be adopted for pavilion units, but pavilions lend themselves to substantial and permanent methods more readily than chalets.

If pavilion units are very long it may be considered desirable to provide covered passage ways from side to side, at least in the centres of blocks, if not more frequently. Thus long walks to reach one room from another, when the rooms are let to families or parties of friends are avoided and access to the different gardens and play areas in the camp is improved.

Dormitories—Sleeping accommodation for camps to be devoted to the needs of children—with only a few adults as supervisory staff—is probably more satisfactorily provided in the form of dormitories than in a large number of small rooms. The former provides better supervision, ventilation is better controlled, and space is saved. Dormitories may be of almost any size, which, up to a certain point, should be settled by the number of staff available for supervision; the staff may be accommodated either in the dormitories, in cubicles partitioned off from the dormitories, or in single rooms adjoining or between each pair of dormitories.

The spacing of beds in dormitories should be based on the use of normal single beds, 6 ft 6 in by 2 ft 6 in, which could be used by adults if required; at least 50 sq. ft. of floor space should be allowed per bed, and this may be increased with advantage to 60 sq. ft., especially if the rooms are not very high. Figure 12 illustrates typical spacing of beds based on a minimum allowance of 5 ft 6 in centre to centre. This allows 3 ft between beds and a central gangway 5 ft wide between ends of beds; the figure is thus based on an allowance of 50 sq. ft. per bed.

If economy is a major consideration, dormitories should have beds on both

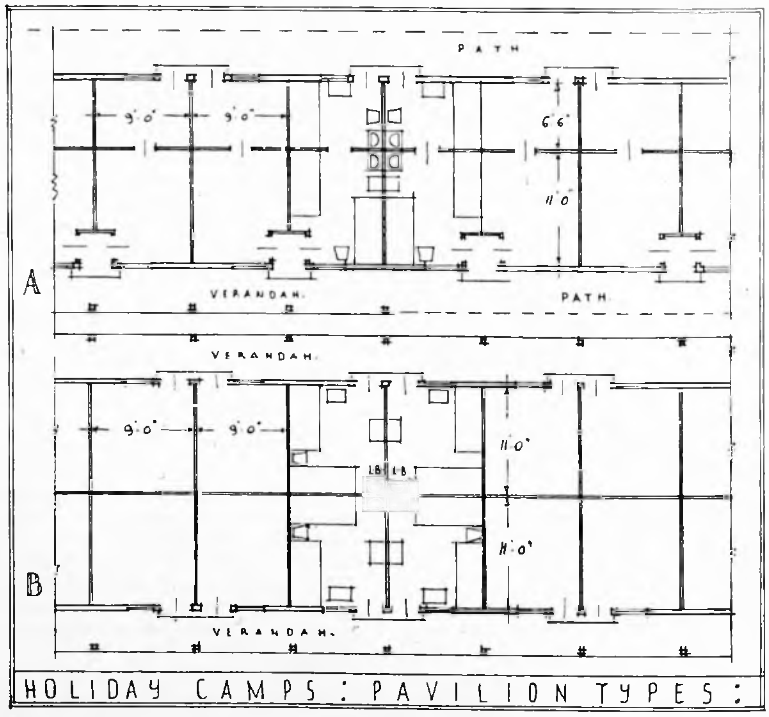


Figure 11

sides of the room, although plans with beds on one side only may be more pleasant. Windows should be placed on both sides of the rooms to ensure adequate cross-ventilation. It is probable that each person will require, in addition to the bed, one piece of furniture, such as a locker or chest of drawers, placed under the windows and between the beds, for storage of clothes and personal belongings. Provision for outdoor clothes (hats and coats) may also be considered necessary; this may be in the form of a rack in the centre of the dormitory, or—better—in a lobby adjoining the room.

Figure 12 also shows an outline diagram of a single-story dormitory block for 40 children, with space for emergency W.C.s or chemical closets and for one or two basins attached at one end; such a space or lobby might alternatively be used as cloakroom for outside clothes and the storage of towels and personal washing apparatus (toothbrushes, etc.). This is an essential provision when all the lavatory facilities are planned in a central group or groups and not attached to the dormitories themselves. It may, however, be considered desirable to plan a lavatory unit between each pair of dormitories or even attached to each unit and then basins should be provided in about the proportion of one to each six persons. It is desirable to place the W.C.s—except those for emergency night use—at a distance from the units. If there is any likelihood of the dormitories being used in the colder months, provision must be made for heating and draught lobbies formed at entrances to the dormitory units.

Sanitary Accommodation—This may be attached to sleeping pavilions or arranged in conjunction with groups of chalets (as already described). Alternatively, it may be provided in a centralised building devoted entirely to W.C.s, lavatory basins and baths, for each sex. How the accommodation is arranged depends largely on the drainage system available, but it should be remembered that to disperse the sanitary accommodation over the site effects a big increase in the cost of drainage and services. At the same time, there is much greater convenience, comfort and privacy for guests if at least some of the sanitary accommodation is dispersed among the sleeping accommodation. Some lavatories and W.C.s near the communal buildings are essential. In most camps, catering for the summer months only, baths are not provided in any number, apparently in the belief that most people bathe in the sea or swimming baths. However, it seems likely that many guests will desire hot baths from time to time during their stay and provision for this should be made. For economy it is wise to group baths together, even if W.C.s and lavatories are spread over the site, because of the hot-water services needed. It is advantageous to place the baths near the boiler house, and consequently near the kitchens, which constitute the other main heating load. Baths may either be of shower or tub types; with women the former do not seem very popular, but less space is occupied. Baths, both shower and tubs, are provided in proportions varying from one per hundred guests to one per fifteen guests, according to the charges made for accommodation. W.C.s should be provided in about the proportion of one to twelve guests, with urinal accommodation in addition, although the number of guests per W.C. might with advantage be reduced and, if the accommodation is spread, the proportion may need to be one to eight guests. Basins need not be provided in large numbers when each sleeping room is provided with its own basin, but if only a central lavatory group is planned, basins should be provided on the basis of one for every eight or ten guests. Figure 13 illustrates a typical unit for a camp of about 350 persons. The separation of the entrances for each sex should be noted; also the provision of a small room or office, which is likely to be needed in a unit of this size, for an attendant. A two-storied sanitary block may prove to be a more economical proposition where large numbers are catered for, by reason of the more compact methods of drainage possible; if this type is used, the women's accommodation should be placed on the upper floor.

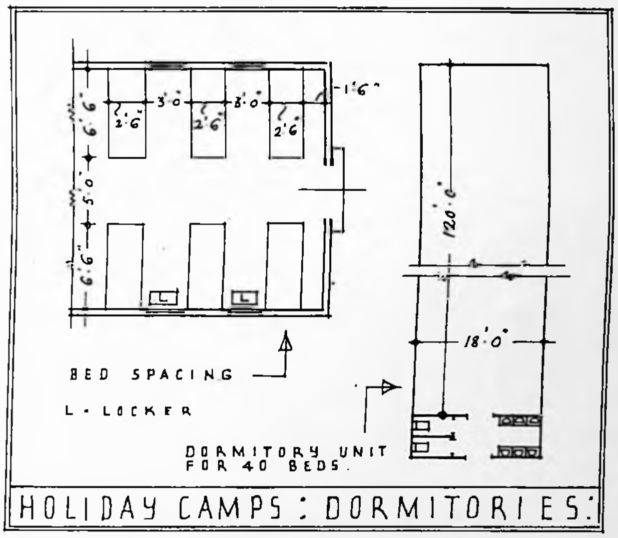


Figure 12

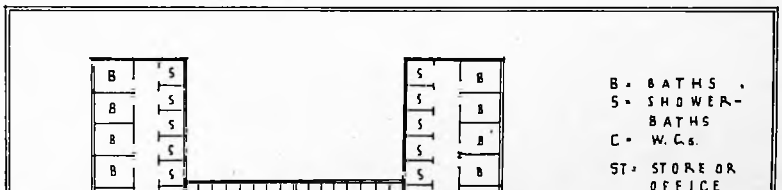


Figure 13

Laundries—Most camps make no provision for washing clothes, except in so far as guests may wash certain articles in the lavatory basins or bath rooms.

If, however, camps are likely to be used for long periods, or very young children are accepted as guests (some camps have a minimum age of two years), consideration may have to be

given to the installation of a small laundry unit for guests, with sinks, drying facilities, wringers and irons. The camp washing of table- and bed-linen, etc., is generally handled by a local laundry, except possibly in the case of very large camps where a laundry might justify the necessary capital outlay.

Recreation—As much space as possible should be set aside for formal and informal recreation, and the open spaces should be in as large units as possible to assist this purpose. Lawns for simple unorganised games are needed, as well as pitches or larger spaces for games such as cricket, rounders, tennis and deck tennis. For children it is desirable to arrange a definite playground with a sand-pit, swings, chute, etc.; this playground would probably be in charge of an attendant or attendants.

Information on planning for recreation is given as a special section and the planning data applies also to this section. Many camps provide a swimming pool and the planning of this unit should follow the information given in the section on this subject, bearing in mind, however, that little dressing accommodation is necessary—since guests use their own bedrooms for changing. Near the bath there must be ample lawns and/or terraces for sun-bathing, while large camps may need a stand for spectators overlooking the bath.

30. *Farm Buildings*

By EDWIN GUNN, A.R.I.B.A.

Introduction—From a condition which might have been described as complete absence of reliable and up-to-date information as the planning and construction of farm buildings, there is now a change in which a wealth of such data is available in the shape of the two "Post-war Building Studies" Nos. 17 and 22 (H.M.S.O., price 2s. and 1s 6d. respectively) devoted respectively to English and Scottish practice.

The buildings of the farm comprise, broadly, four divisions in combination: (1) Buildings to house livestock; (2) crop-storage; (3) fodder and its preparation; (4) shelter for implements. Of these the first is obviously of chief importance, since even minor errors in planning or structure may be detrimental to the wellbeing of the animals housed or dangerous to those who tend them.

In combination the planning problem is not essentially dissimilar from that of most buildings—it is one of circulations. But it has exceptional features. Rather belatedly, the generality of farmers are at last coming to realise that a condition of filth is not so inevitably natural to farm buildings and their surroundings as past appearance might suggest, and as a consequence there is superimposed on the ordinary aim of planning for the most direct access from point to point the additional problem of ensuring that dirty circulations shall not intersect or coincide with those which in themselves might remain clean. This consideration is, of course, paramount in connection with milk-production but gains ground yearly in relation to all livestock, which is at the same time the origin of most of the filth and most in need of protection from it.

The most complex of the circulational puzzles which attach to farm planning is that relating to the cowshed intended for tying up a milking herd, and Figure 1 illustrates the different routes involved. In the single rank house (when other circumstances favour) it is possible to separate the four essential services, but when double-ranking begins at least two of the routes must cross, so that it becomes a question of combining those least affected by each other—say, incoming fodder and outgoing milk.

In dairying practice circumstances have combined to render the big tie-up cowhouses less popular, and to cause many farmers to organise their milking procedure on the basis of the milking-parlour or lactory, to which cows are drafted in batches from covered or open yards or from pasture fields according to season. This system, which calls for some ingenuity in planning, if in and out circulation is to be arranged with easy working, has been highly developed by the firms who produce mechanical milking equipment, and by one or two independent specialists, perhaps the highest degree of organisation being reached by Mr. G. Rosenberg, whose patented plan utilises some half-dozen gates as "cow-valves" to regulate circulation with a high degree of certainty. (Figures 2 and 3.)

Other general considerations relate to access for delivery and removal of crops and fodder, which necessitate road surfaces negotiable by wagon or lorry with suitable manœuvring space; storage for field implements so arranged that these can readily be withdrawn or replaced singly at will; passage of animals to pasture for feed and exercise without danger or loss of control; and planning of buildings so as to secure for livestock the maximum protection from cold winds and a sufficiency of unobstructed sunlight—chiefly from south and west. The last-named condition is usually satisfied by disposing the range devoted to storage and preparation of fodder so as to run east and west along the north side of the yards and buildings housing livestock.

Under modern conditions it is not unusual to obtain further protection by disposing a range of Dutch barns or haysheds parallel to the last-named range with a roadway common to both dividing them. This shed being full when cold conditions obtain and empty during early summer, can well serve this double purpose of storage and wind-screen. Since a portion at least of its crop-content will be fed to stock, it is also thus conveniently placed in relation to fodder supply arrangements (see Figure 4).

Structure and Material—The outstanding requirements here are solidity and ability to stand rough usage, coupled with sanitary surfaces which will yet not engender chill. These desiderata unfortunately conflict seriously with a third requirement which is usual—the utmost economy, since capital for new farm buildings is rarely obtainable in proportion to the needs.

For main structural needs brick, concrete and timber all have their

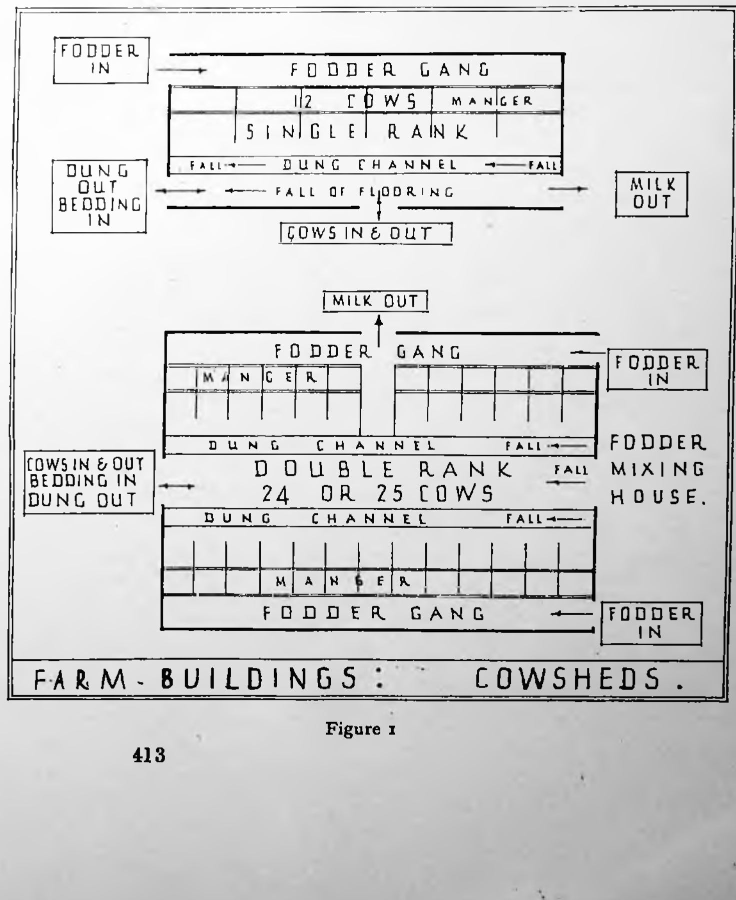


Figure 1

uses and special suitabilities, while for roofing, tile, slate, asbestos-cement and corrugated iron (selected with judgment) can be employed. For internal divisions such as pens, stalls, and the like, there is an increasing tendency to use iron tubular construction, for its cleanliness and absence of obstruction to due circulation of air.

Internal condensation on roof soffits is one of the troubles in most buildings used for the housing of livestock. Conditions in this country do not favour the practice usual in Canada and Northern Europe (and formerly in Northern England) of storing fodder and bedding materials in a vast loft above the byres and stabling, by which means drip from condensation moisture is reduced or obviated. Nor do British farmers, as a rule, feel it necessary to follow the practice, not unusual in Scandinavian cauntries, of

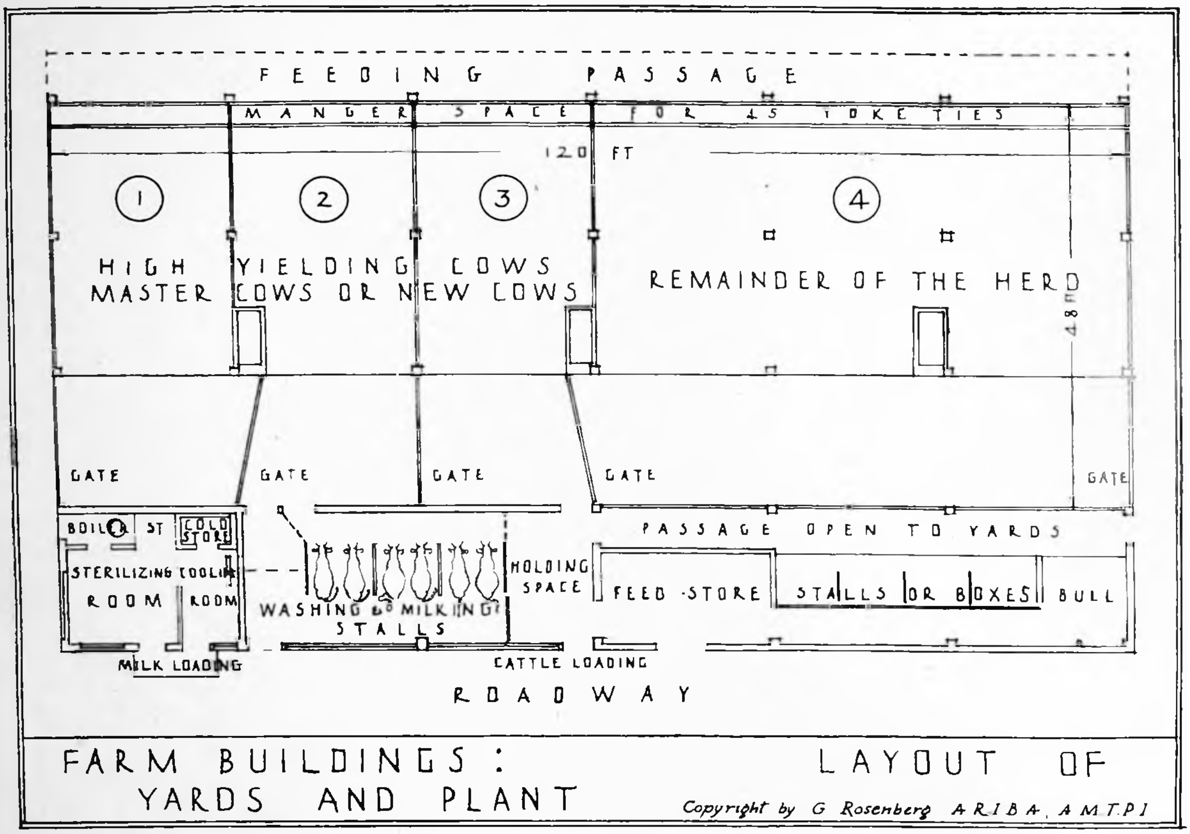


Figure 2

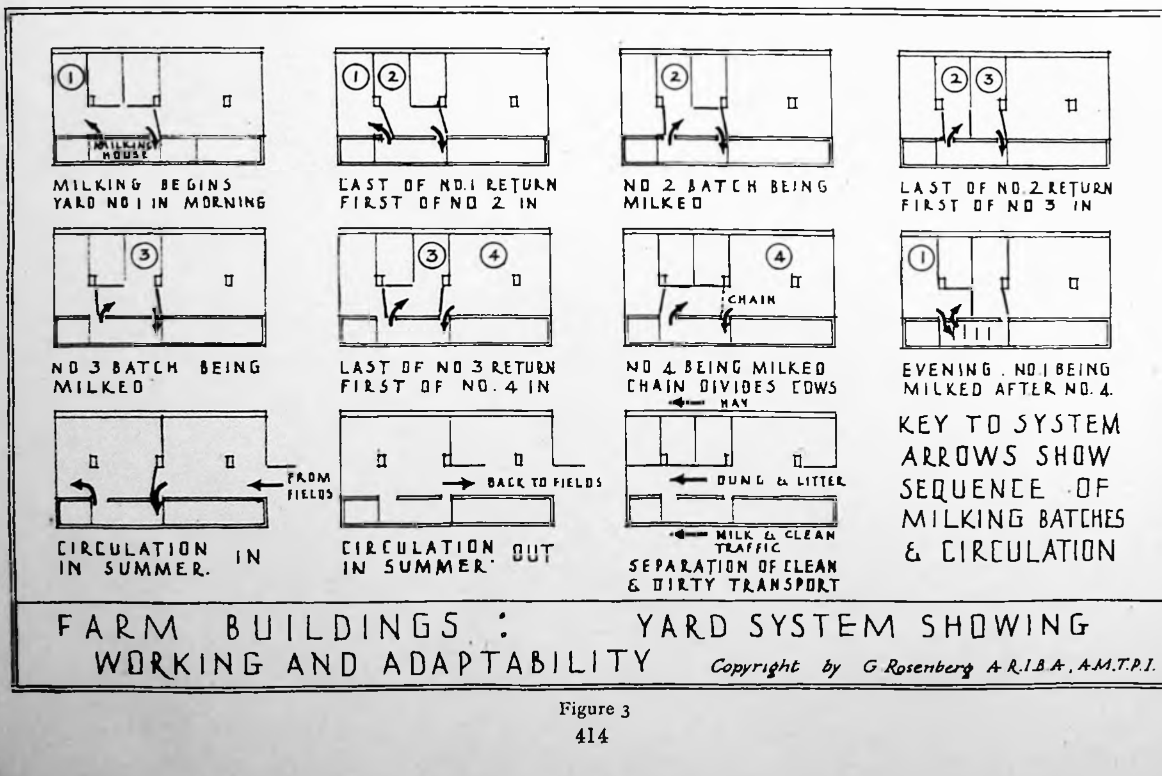


Figure 3

warming their animal houses by hot air stove, on the principle (said to be economically sound in cold climates) that "it is cheaper to heat with coal than with corn." Hence it is a practical necessity to provide either a non-condensing lining beneath any roofing material which is so conductive and non-absorbent as to be frequently cold enough to condense internal moisture from the steamy air of byres, or to arrange a circulation of air beneath the condensing surface sufficiently brisk to prevent condensation.

Site and Surroundings—As with every other type of building, the ideal arrangement is usually rendered impracticable by external influences. All such factors as proximity of other buildings, direction of slope, prevailing wind, existing road access, situation of arable and grass fields, water and drainage facilities (and these singly or in combination), must be considered in relation to most schemes for new buildings or additions to existing ones.

Necessity for Clear Programme—Few architects can have the opportunity of becoming skilled farmers, any more than they are skilled doctors or theatrical producers. Nevertheless they succeed in designing very satisfactory hospitals and theatres, both tasks which call for more complex planning and arrangement than the most extensive set of farm buildings. The relevance of this statement lies in the difficulty often experienced in obtaining from farmers and land agents commissioning buildings clear instructions embodying their intended manner of use. Farmers in particular are apt to assume that all they know of right relationships between the component parts is (*a*) common knowledge, and (*b*) the only possible solution. Farming aims and methods, even in this small country, differ from district to district so widely that there is none which can be described as standard, and it is of the utmost importance that anyone starting to plan or adapt buildings (particularly buildings for stock) should obtain a clear idea of the routine which is followed throughout the day and at all seasons.

As instances of the wide divergences of practice a few specific cases may be quoted. In the potato-growing districts of Lincolnshire it is necessary to provide rat-proof storage for a considerable bulk of seed potatoes, and a special glasshouse known locally as a "chitting house" in which these may in due season be exposed to light so as to encourage shoots. In some of the corn-growing districts it is the custom to take advantage of the presence of thrashing machinery to chaff sufficient straw to supply this fodder ingredient throughout the winter; this necessitates a special apartment known as a "chop-house" or "cut-house" for its storage. Instances could be multiplied but others will emerge in later notes.

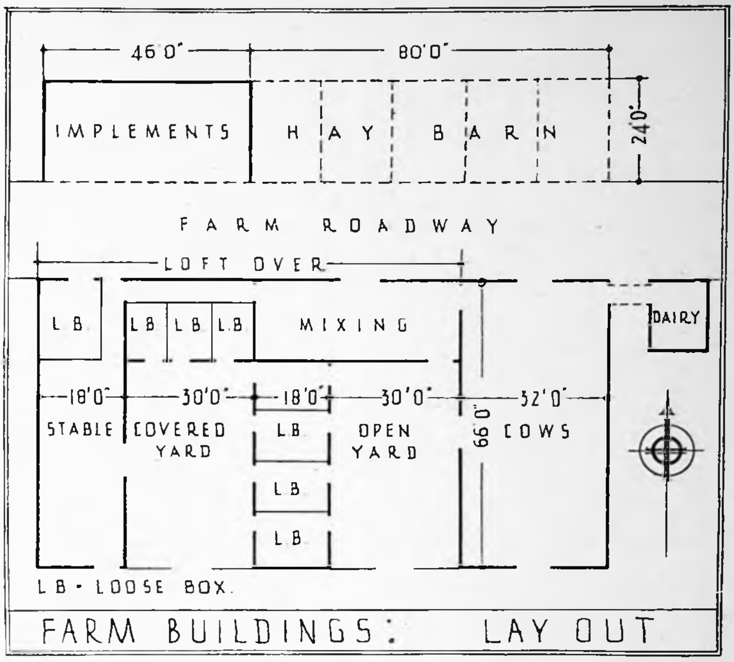


Figure 4

BUILDINGS FOR LIVESTOCK—THE COWHOUSE

Site and Surroundings—A cowhouse should be so placed as to receive as much light (and particularly sunlight) as possible, and should not be closely involved with other farm buildings. It should occupy a dry situation, with shelter from prevailing cold winds or south-westerly gales, according to which manifestation is most troublesome in the district. A single-range building is best placed with its long axis east and west, the cows' heads facing north. A double-range house is preferably laid out north and south, so that sun reaches each long side at some time in the day.

A clean and convenient access for cows to pasture, if possible without traversing a public road, and direct and sheltered ways from fodder-mixing floor, and for the passage of milk to the cooling room, are all essential.

Essentials of Plan—In all but the smallest cowhouses it is desirable to have three ways of access; one for cows to enter and leave and for manure to be taken out, another from the fodder and mixing room, and a third for the passage of milk to the cooler or dairy. The latter should be either detached or, if part of the same range, approached only from the open air and not by doorway directly from the cowhouse. A covered lobby is, however, convenient. If more than fifteen cows are to be accommodated, or if extension is a possibility, the double-range form offers advantages in economy of cost and of traffic. Farming opinion has long debated the relative advantages of tail-to-tail and head-to-head placing in double-range houses, but the former is now generally advised. Cows' heads are thus kept near to the sources of fresh air, and dung is confined to one passage.

The most recent legislation lays down no regulation as to space or cubical contents, and the official view merely stresses the importance of clean approach and good lighting and ventilation. Previous to 1926, when the Milk and Dairies Order came into force, there were regulations which stipulated 600 cu. ft. per cow in most areas, and 800 cu. ft. in towns, where cows were not turned out for part of the day. These rules are now obsolete, but may be found in force in a few county boroughs which have their own Local Acts.

Dimensions.—In calculating dimensions 3 ft 6 in width should be allowed for each cow, and no more than twelve cows in line (in a double-rank house) without a cross gangway equal to the width of one standing.

The transverse dimension of a cowhouse depends on various factors according to type, and Figure 5 gives several versions. Average standard dimensions for the several divisions are as follow:—

Feeding-passage (if provided)	3 ft 0 in
Mangers or trough	2 ft 6 in with side ties; 3 ft with central ties
Standing	5 ft 0 in
Dung channel	3 ft 0 in
Rear gangway (single rank)	4 ft 0 in
Rear gangway (double rank)	5 ft 0 in

Single-rank house 17 ft 6 in or 14 ft 6 in by omission of feeding-passage.

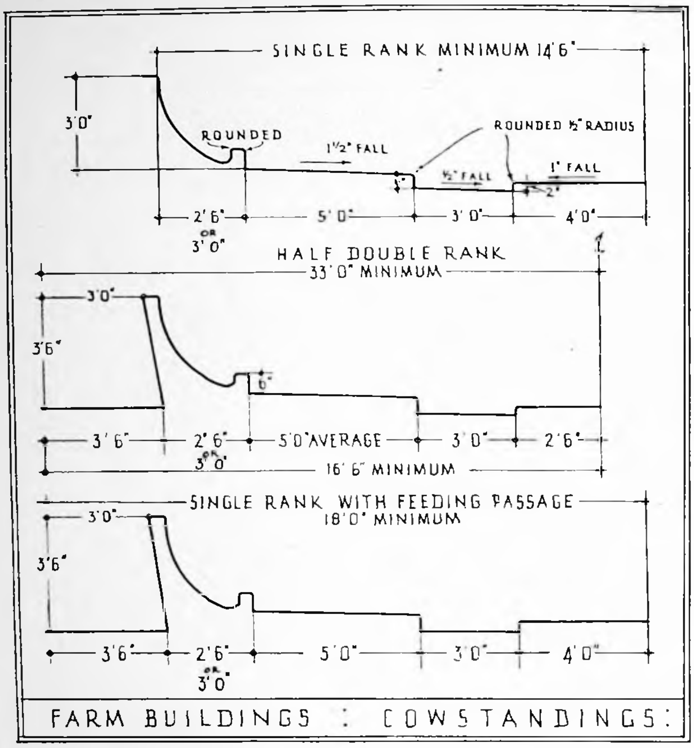


Figure 5

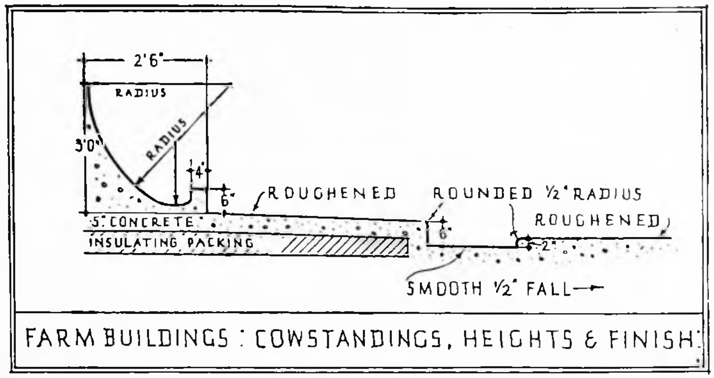


Figure 6

The minimum width for a double-rank house based on the above figures is thus 33 ft, feeding-passages nearly always being found a necessity in this type. The 5 ft dimension for length of standing is an average one, some types of cattle requiring 5 ft 3 in and others 4 ft 9 in or less, but it is safer policy to adopt the average in deciding the width of the house, as this permits freedom in choice, and adjustment can be made at the expense of the dung channel. It should be realised that the shorter the standing can be made without inconvenience to the cows, the more easily they will be kept clean, which is one of the principal aims of cow-house design.

All the dimensions given above, except width and length of standing, can be increased by a few inches with possible advantage, but, in the case of the space allowed for the standings, *increase will be actually detrimental* by allowing cows freedom of movement which might result in the fouling of their standings.

Details of Standings—The dimensions and falls shown on the cross-section Figure 6 are the result of experience, and should not be varied. The shape of the manger is that found suitable for yokes or close-tying ; the slope of the standing is the maximum which permits comfort to the cow ; the height of the rear step discourages a cow from standing with its hind feet in the channel, and raises the standing sufficiently to minimise splash thereon ; the width of the dung channel ensures the cows stepping in it when entering the standing (a narrower channel might be jumped, with dangerous possibilities) ; the back step reduces splash on the rear gangway.

Stall Divisions—Stalls may accommodate one or two cows, the latter arrangement allowing rather more freedom to the milker when hand-milking is practised, but single standings, that is, a division to each stall) are usual when stanchions are used for securing cows. All solid divisions tend to impede free circulation of air, and to create angles difficult to clean ; for this reason galvanised steel tubular divisions are usually preferred.

Tyings—The aim of any system of tying is to secure that a cow should stand and lie as nearly as possible on the same ground ; therefore, only two systems are virtually possible—the yoke system in one of its forms, or close-tying by double chains, as shown in A and B in Figure 7. A yoke system with stanchions necessitates a feeding-passage, since access to the manger from the front is impeded.

Feeding Troughs—In order to preserve equal height to steps, manger, etc., throughout the length of a cowhouse, it is usual to give a common inclination to the complete floor and manger structure in the direction of the drain outlet. Outlets should be provided from the dung channel at intervals not greater than 50 ft (in the form of cross-channels if the total length exceeds), and the fall to the outlet may be either in one direction or both ways as the ground suits. To facilitate manger washing, drainage outlets from the lowest point should be provided. If it is desired to partition the trough between animals so as to prevent poaching of rations, hinged galvanised iron divisions, which can be raised to free the trough for cleansing, can be supplied by the makers of divisions, stanchions and similar fittings.

Light and Ventilation—An area of at least 3 sq. ft. of lighting surface per cow is desirable, but much more is to the good. Strong light should fall on the hindquarters of the beasts, with good general lighting everywhere. Roof lighting has more effective value than windows, and is essential over the centre gangway of double-rank houses. For windows the hopper type, falling inwards between solid cheeks, combines light and ventilation suitably. Outlet ventilation should be provided near the apex of the roof, either by opening lights, good windows in the gable ends, or other means. Open louvers unprovided with any means of control are not a *satisfactory* means of ventilating a cowhouse.

Structure—While any of the orthodox methods of building—brick or concrete walls and roofs tiled or slated —are appropriate, economy often dictates a slighter form of building, and with judgment and discrimination a perfectly good cowhouse can be constructed mainly of timber and asbestos

cement or bituminous sheeting. It may be observed that in the double rank "tails in" house animals and dung only make contact with the walls over short lengths of the end walls, so that if these are made resistant there is no real objection to a timber structure, which should, of course, be mounted as usual on a brick or concrete base. Alternative sections are given in Figure 8. The height of the side walls need be no greater than that of the doorheads—about 7 ft—and the roof design will naturally depend on its covering. The tendency for dripping to arise from internal condensation on a cold roof surface must be recognised, and measures taken to avert it. A flat roof with clerestory lighting, covered with bituminous sheeting on boards is one method (A); a pitched roof covered with asbestos cement sheets is another (B). In the latter case condensation may be prevented either by adequate ventilation between eaves and ridge, or (with greater certainty) by an underlining of insulating wallboard.

A scheme of structure which spaces roof trusses 10 ft 6 in centres—equal to three cow standings—is usually convenient, and a purlin roof without common rafters suits either method best. Principals of light steel construction offer less harbourage to dust than wooden trusses.

In the construction of floorings, insulation from cold ground is necessary, and is readily afforded by an underlayer of coarse hard core, say, 8 in thick or more, beneath a minimum thickness of concrete. Other means sometimes adopted are a layer of hollow clay blocks or land drain-pipes beneath the raised standing. The floor surface in the house—if of concrete—should be smooth in the dung channel and manger, and slightly roughened on standing and

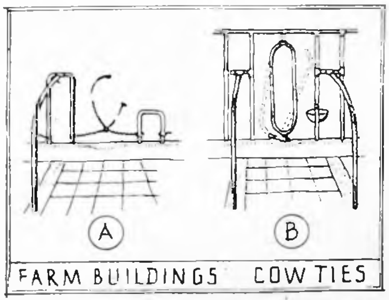


Figure 7

gangways: lightly scoring with a stiff broom gives as good a non-slip result as anything.

Several methods of contriving a standing which shall form a warmer cowbed than bare cement are current, but all at increased cost. The standing may be paved with cork asphalt or similar bituminous preparations, either laid *in situ* or in blocks, or it may be covered with doubled asbestos cement flat sheets embodying an air-space.

It is worthy of note that although all salient angles should be rounded, those forming the arrises of steps should not be overdone—a radius of ½ in is enough.

Unorthodox Provisions—It is not every farmer who will desire to keep his cows in a tie-up milking house. For one reason and another he may prefer to keep them largely in the open or in covered yards, with a milking shed smaller than would accommodate his full herd, to which cows are driven for milking solely. The spread of mechanical milkers favours this practice, which in its most advanced form employs a movable "milking bail" which travels about the pastures where the cows graze in the open throughout the year. Only in districts where the land (chiefly downland) will not "poach" under the feet of cattle in wet seasons, is this method practicable, but the small milking bail, as an alternative to the more expensive cowhouse, is a possible expedient almost anywhere.

Under this system, shown in Figure 9, animals enter stalls by gates at one end from a collecting yard, they are retained by a chain across the entry, and fed with cake while thus tethered for milking. After milking, each cow is released by the operation of the manger-gate at the forward end of its stall, this being actuated by a lever-rod under control of the single attendant. Cake is admitted in measured quantity to each manger from hoppers in a loft gangway above, also by the operation of a rod.

The milk is drawn off by suction attachments and conveyed first by tubes to sealed glass containers between each pair of stalls, where it can be automatically weighed and recorded. It is then passed (by means of a special valve) to the cooling house without handling, and thence through the cooler to churns or other receptacles placed ready to receive it.

One milking unit (holding two cows) is capable of dealing at each milking with fifteen cows, and two units (holding four cows) constitute the smallest economic scheme, capable of milking thirty cows. A higher number, up to sixty cows, can be run by a man and a boy, and shows perhaps the maximum economy.

In planning for this system, it is well to remember that a collecting yard may be provided for waiting cows, but those liberated after milking should find it possible to proceed directly to their shelter sheds (in inclement weather) without further attention. Gates and passageways so used should not exceed 4 ft. in width—otherwise cows may turn and impede the circulation.

Many variants utilising existing yards and buildings are possible, and will differ according to circumstances. A number of alternatives are illustrated in the publications before referred to, and a specimen example is given here. (Figure 10.) This is "factory-farming" in truth.

Cattle Yards—The covered fold-yard in which cows are wintered, in conjunction with the milking-shed last described, should be calculated on a basis of about 100 sq. ft. per cow, with a minimum dimension in any one direction of about 24 ft—a yard 60 ft by 24 ft should accommodate fourteen or fifteen untied cows. Such a yard is valuable for "making" manure, a process which depends upon the combination of straw or other bedding, with dung and the treading of cattle. Provision must be made for exclusion of cold winds, which means that any sides not surrounded by buildings (or the whole circumference if free-standing) must have a close fence about 6 ft in height. Light and ventilation must not be excluded, and this is arranged by allowing an open space of about 2 ft between fence and eaves, or, where the yard is bounded on three sides by buildings, by an increased opening at the free end, which should face south. A suitable cross-section is shown in Figure 11. For roofing such a yard no material is superior to creosoted spaceboarding, which admits an appreciable amount of light and air, and is both cool in summer and warm in winter.

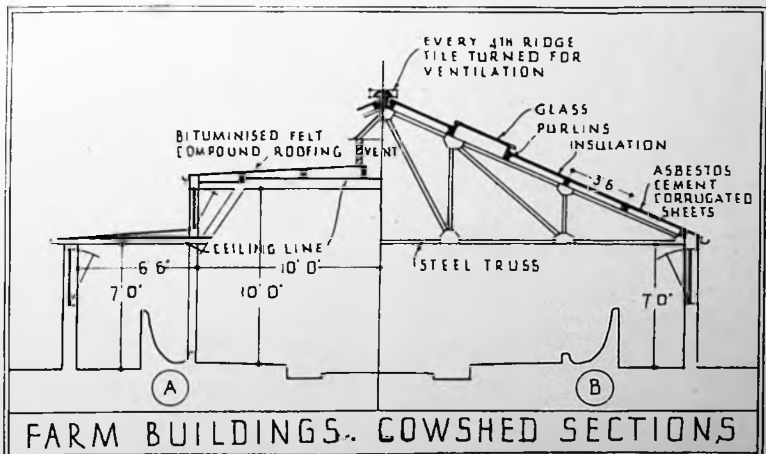


Figure 8

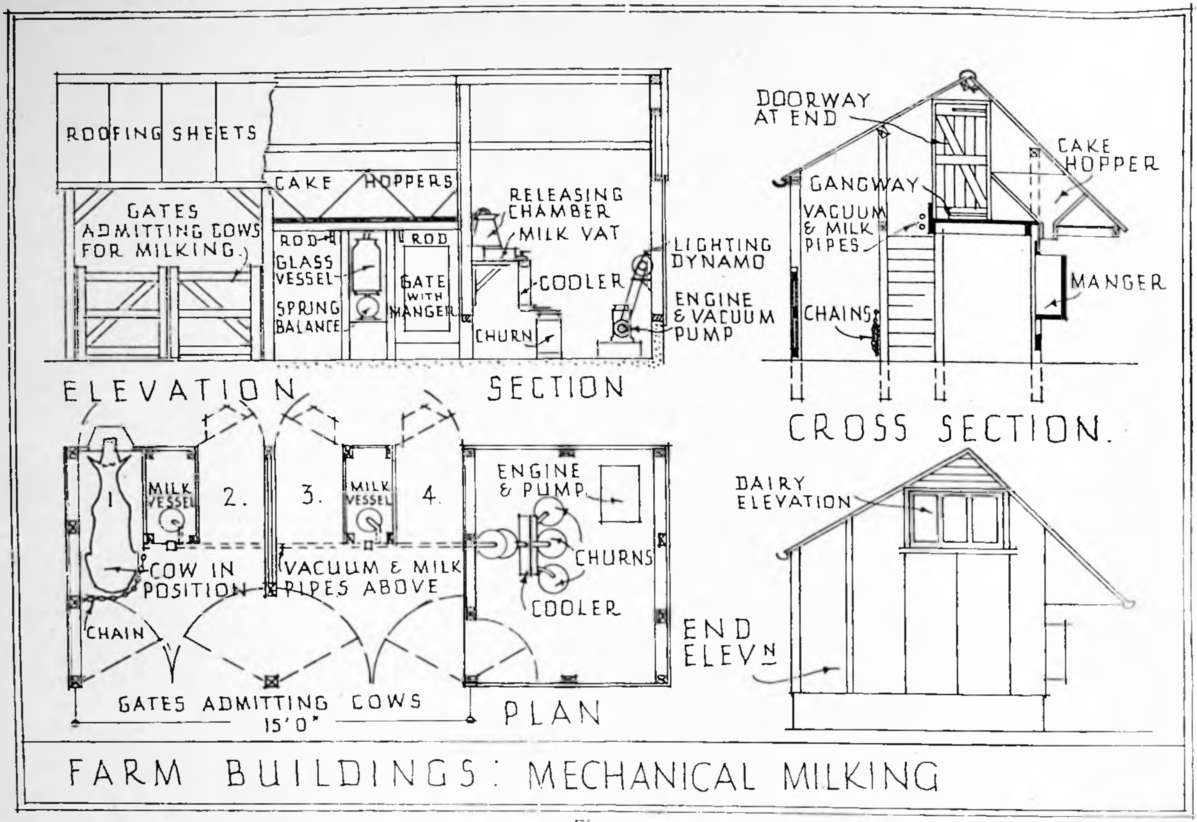


Figure 9

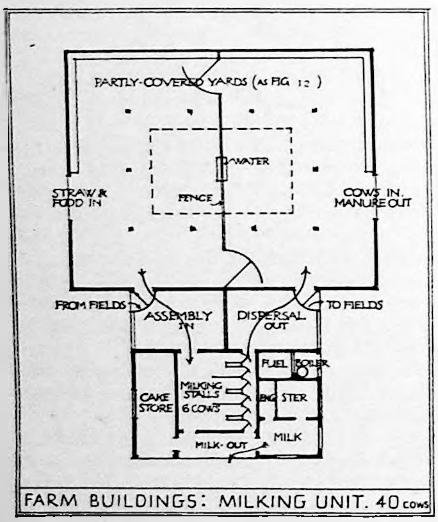


Figure 10

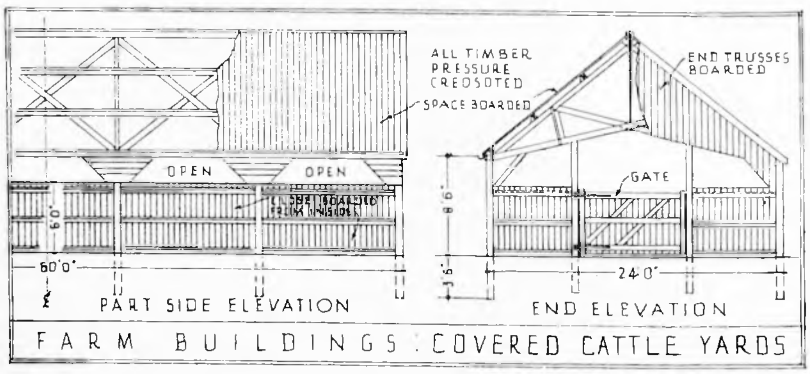


Figure 11

A similar yard serves also for fattening bullocks, or for the keeping of any store cattle under the best conditions. It should perhaps be said that one of the purposes for which all cattle are kept is the production of "muck" for the enrichment of the land, and this aspect has equal or greater importance than the direct profit which may be gained. Rainwater—at any rate in excess—should be excluded from a cattle yard, which it should be possible to run without drainage, the liquid arising from the cattle being absorbed by the bedding material, which is frequently supplemented by new layers.

CATTLE-SHEDS, CREWYARDS AND STABLES

Open Yards.—In the districts where arable farming is practised, it is usual to maintain a considerable herd of beasts, which are confined in open yards surrounded by buildings, one or more of which take the form of shelter-sheds open to the yard, and containing a manger. Such sheds should be at least 14 ft in depth and 7 ft to the eaves; the latter dimension is likely to be reduced by 2 ft as the yard level rises with trodden "muck" previous to the annual "mucking-out." The yard bottom should be stoned and dished, with a 3 ft. sq. grated catch-pit for drainage. From thence a straight drain at least 6 in diameter should run to a second deep catch-pit outside the yard to trap solids and sediment, and thence by 4-in drain to an outlet. All cattle-yards should have drinking troughs supplied, if possible, by ball-valve in locked chamber forming part of the trough, or by gravity from a levelling tank.

A form of partially covered yard which has been found successfully to combine the advantages of shelter and sunlight is illustrated in Figure 12. It has been found that ascending warm air from the cattle and manure tends to rise through the central opening, so preventing excessive down-draughts of colder air. No arrangement so far devised however seems to offer *every* advantage, and in this type of yard the delivery of fodder and removal

of muck present difficulties—particularly if mechanical muck-clearing, using apparatus at present available, is intended.

Purely grass dairy farms need a different type of yard—the assembly yard for cows, used previous to milking or for turning out tied cows to air during winter; this is a clean yard, paved, drained, and frequently scavenged.

Field Shelters or "off-buildings" with or without fold-yards are usually required on farms of any extent, situated in grass fields distant from the homestead. These are intended as a refuge for grazing stock from rain, storm, bitter cold, wind, or sun, or may be used to house fattening stock in such position that they will consume fodder stacked nearby and make "muck" close to the land which needs manuring, thus economising labour in cartage both ways. These shelters are commonly closed to the north, east and west, but open to the south, and their detail and dimensions are similar to the cattle sheds already described, though often they are of slighter construction. The most useful type embodies a loose box at one or both ends, as shown in Figure 13, as this provision may be used to confine a sick animal, or as a store for fodder, or for numerous other purposes. Loose boxes should be floored in concrete, the open sheds need no floor.

Loose Boxes—These omnibus provisions are useful for many purposes; for the secure housing of any stock—horses, cows, pigs, calves, or even poultry—as well as for certain specialised uses such as calving or foaling, for segregating a sick animal or a new acquisition under precautionary observation; sometimes as a chaffhouse. No farm building is complete if it does not comprise at least one large loose box, say 12 ft by 14 ft, though 12 ft by 16 ft is better, as giving greater facility in drawing a calf or foal. Smaller boxes down to 12 ft by 7 ft in size are also useful for a single animal, for calves or young pigs, or on occasion for a pair of cows. The furniture of a loose box is simple—a wide half-door, say, 7 ft by 4 ft, light and ventilation in moderation, and a manger which preferably is adaptable to various types of stock. The simplest device of this kind is to fit two corner cribs, one about 1 ft 6 in to the chin rail for cows or bullocks, and the other 3 ft 6 in for horses. If smaller livestock are introduced portable troughs can be used. Brick or concrete floors with a fall of $1\frac{1}{2}$ in. in 10 ft towards door or outlet, but without internal drain gulley (soon blocked) are most generally suitable.

Bull Pen—The bull is sometimes tethered to a stall in the cowhouse, but preferably given greater freedom in a special pen adjoining. This should have a size of about 10 ft by 12 ft with stout tubular enclosure and strong gate.

Calving Box, sometimes now called Maternity Pen, may be somewhat similar, but of greater size—12 ft by 15 ft allows space for working.

Calf Pens for weaned calves should allow manger space about 1 ft 6 in in width per calf, with divisions to check food poaching. Many farmers believe that calves do better if they are placed in positions where they can be interested in nearby activity! The plan shown in Figure 14 gives a suitable relationship of the parts of a large-scale dairying set of buildings. The cowpens shown therein are intended for cows with new-born calves, and the range labelled "young stock" (which is generally similar to the cowstandings) would stand either young heifers not yet in milk, dry stock, or barreners. Such buildings as this are common in Canada and U.S.A. though, owing to our large amount of solidly built and obsolete equipment which we cannot afford to scrap, less often in this country.

Stables—Owing to the increased use of mechanical power, the cart-horse stable is of less importance in farm equipment than formerly, but stabling for at least a few horses will no doubt continue to be provided.

The width of standing proper to a heavy draught horse is generally agreed as 6 ft. The actual space occupied by a horse with room to lie and rise may be taken as 6 ft by 9 ft, and where a stable accommodates two horses only and the doorway is placed centrally behind them a depth of 14 ft is just enough. With more horses in rank, involving the necessity of passing behind stalled animals, a minimum of 16 ft, with a desirable excess over that, should be planned. See Figure 15 A and B.

The furniture of a stable consists of stall divisions, manger and hay-rack, for which suitable provision is shown in Figure 16. The hayrack is sometimes preferred as a continuation of the manger—that is, the chinrail continuing at one level, but the manger interrupted halfway—in the alternative form shown in Figure 17. By this arrangement dust and seed are less liable to get in the horses' eyes, but

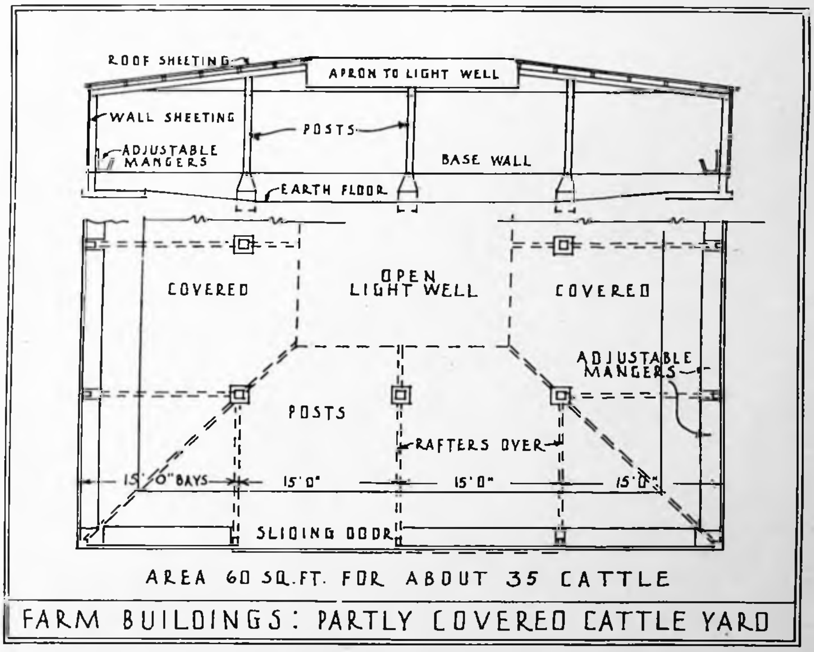


Figure 12

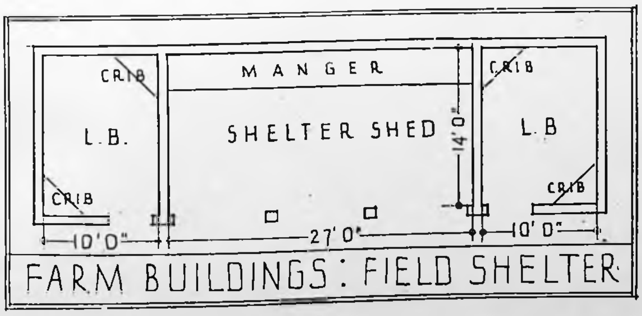


Figure 13

against that, hay is more liable to be trampled and wasted.

Stable floors require special attention, as (particularly under the horses' hind feet) they are subjected to heavy pounding and abrasive wear. Blue Staffordshire checker paving bricks or Adamantine clinkers are practically the only things which will stand this wear, and if it is too expensive to lay whole standings in these materials, a " heel-panel " as shown in Figure 16 will meet the case, the remaining flooring being in concrete. Drain gulleys are better placed outside, channels being led to them by cross channels passing the gangway if an end wall is not available.

Harness and Gears in big establishments are best provided for in a separate harness room, where they will not be in contact with the alkaline vapours of the stable ; but where space cannot be afforded, stout wooden brackets, firmly built in or otherwise secured, may be placed behind the rear gangway.

Windows should not face the horses, but should preferably be high in the rear wall. Roof lights (even glass slates or tiles) make a valuable supplement to the main source of light and air, which is the upper half of the usual half-hack door.

Stable Doors come in for rough usage, and the following provisions should be observed. Size should be 4 ft wide by 7 ft high, frame out of 6 in by 3 in (at least), well cramped to walls, and dowelled at foot, with all arrises rounded and brick jambs bullnosed up to 6 ft high. There should be no reveals, so that the half-doors can lie flat against the wall face when open, secured by a simple catch. The doors are best framed and braced, with a strip of hoop iron screwed to the top edge of bottom door to check crib-biters. If merely ledged doors are used nothing less than $1\frac{1}{4}$-in stuff should be used, and the ledges should extend to the edges of the door (the rebates in frame checked out to receive them), so as to take the slam, and as an additional precaution the end boards should be *screwed* to the ledges. Stout smith-made hooks and rides should be used for hanging, and these should be bolted throughout. Fastenings should be wrought-iron without dangerous projections, and of a type easily operated by one hand. An S latch and a Brenton bolt, which can be padlocked on occasion, is a suitable provision.

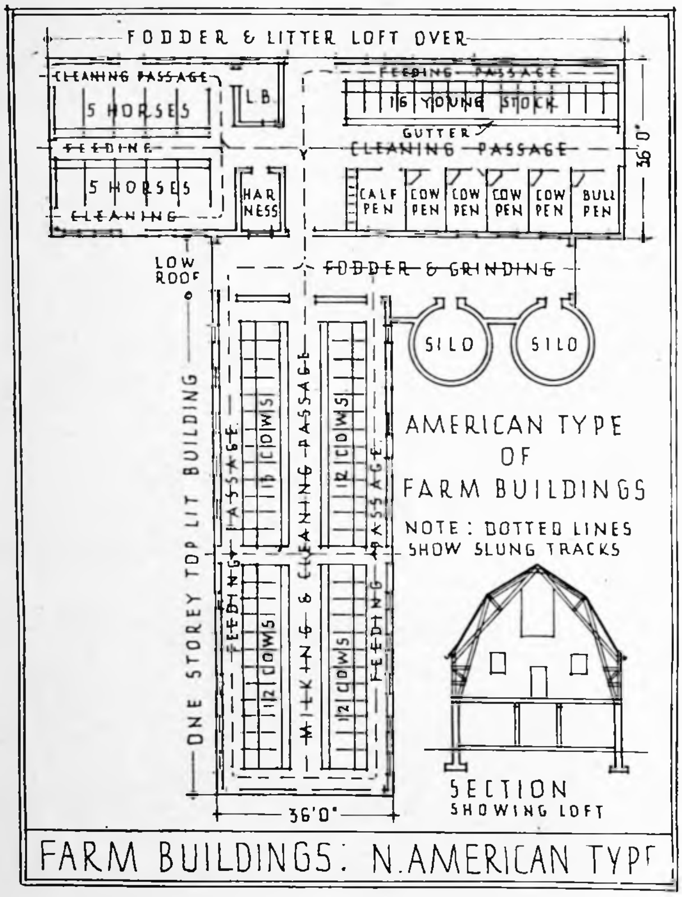


Figure 14

PIGGERIES

In deciding on the scope of buildings intended for the breeding and fattening of pigs it is necessary to ascertain whether the aim is to keep a few pigs as a supplement to other farm stock—perhaps chiefly as a means of converting waste products, such as whey and vegetable cast offs, into marketable produce—or whether pig breeding is to be a chief industry, as with many Scandinavian farms. The former class of stock may be sheltered in loose boxes, covered yards, etc., available in turn for other animals, with perhaps a few farrowing pens ; the latter class is best provided for by a fully equipped pighouse specifically intended for its sole purpose.

Two other forms of equipment for pigs hardly fall within the scope of these notes, namely, the open-air system and the cottagers' piggery, though the suitable arrangements for this latter type are shown in Figure 18. Special points to be noted thereon are :—

(1) Doors to stys so placed that pigs will lie against the internal division wall.

(2) Door to pen so placed that the yard is traversed diagonally. This results, in effect, in greater cleanliness, as dunging and feeding can take place (and usually do) clear of interference.

(3) Roof pitched away from yards, preventing flooding by damaged or overflowing gutters and giving height for more than a creeping door on the front, which should face south.

(4) 6-ft high doorways available for sunlight and inspection, with *upper* half to a level below pen fence closable at will by a half-door for increased shelter.

(5) A check step down from sty to pen, to prevent the entry of surface water.

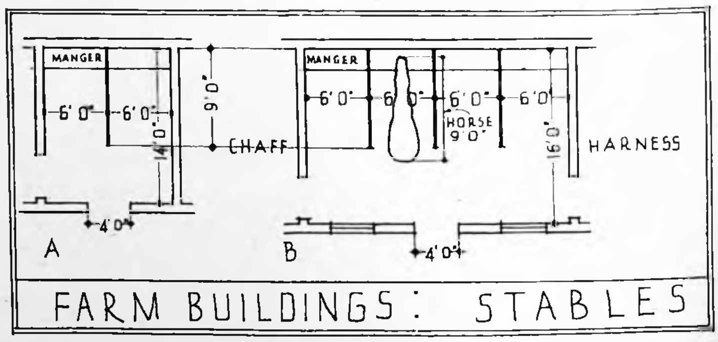


Figure 15

(6) Pen paling put on from inner side to prevent pigs from gnawing rails or forcing off the boarding. In all but the coldest districts this boarding can be spaced $\frac{3}{4}$ in apart (more may enable pigs to gnaw or dislodge), by which means the air circulation and dryness of the pens are materially increased.

It should perhaps be said that the pig (contrary to general opinion) is not a dirty animal, and, if given the chance, will avail itself of facilities for preserving its bed in a clean condition. Less fortunately, it is subject to epidemic diseases, a fact which is recognised by the power given to the Ministry of Agriculture to close a farm for six months after an outbreak if housing is of absorbent material, such as timber, or for twenty-eight days if a material more easily disinfected, such as concrete, is used.

Indoor Piggeries—A simple type of pighouse suitable as part of the equipment of a mixed farm is shown in Figure 19, and requires little explanation. The detail of combined pen fence and feeding trough is given in Figure 20. This arrangement is less cumbersome and seems as convenient as the better-known swinging shutter.

The Scandinavian type of pighouse, which in a modified form has attained some popularity in this country, is a more highly organised affair which requires some explanation. In the plan, Figure 21, the building is divided into two parts (of which the left is incompletely shown) by a central driveway open to the roof, from which fodder and bedding can be unloaded to the extensive lofts covering the pens, and valuable when full for their insulative value.

The portion on the right contains (as well as the fodder-mixing room and a central heating stove) the breeding accommodation. This comprises a boar pen, a large farrowing pen divisible as two ordinary pens, four pens for sows with litters, each having in connection a smaller pen reached by a creep-hole in which piglings may be fed. There are also two weaning pens facing south and open to as much sunlight as possible.

The portion on the left consists of fattening pens to which litters of pigs, after weaning, are transferred. These pens are graduated in size, so that pigs may be moved along as they grow, arriving at the largest pen when ready for market. The trough length is the real measure of the capacity of a pen, since it is this dimension more than the depth of the pen which counts.

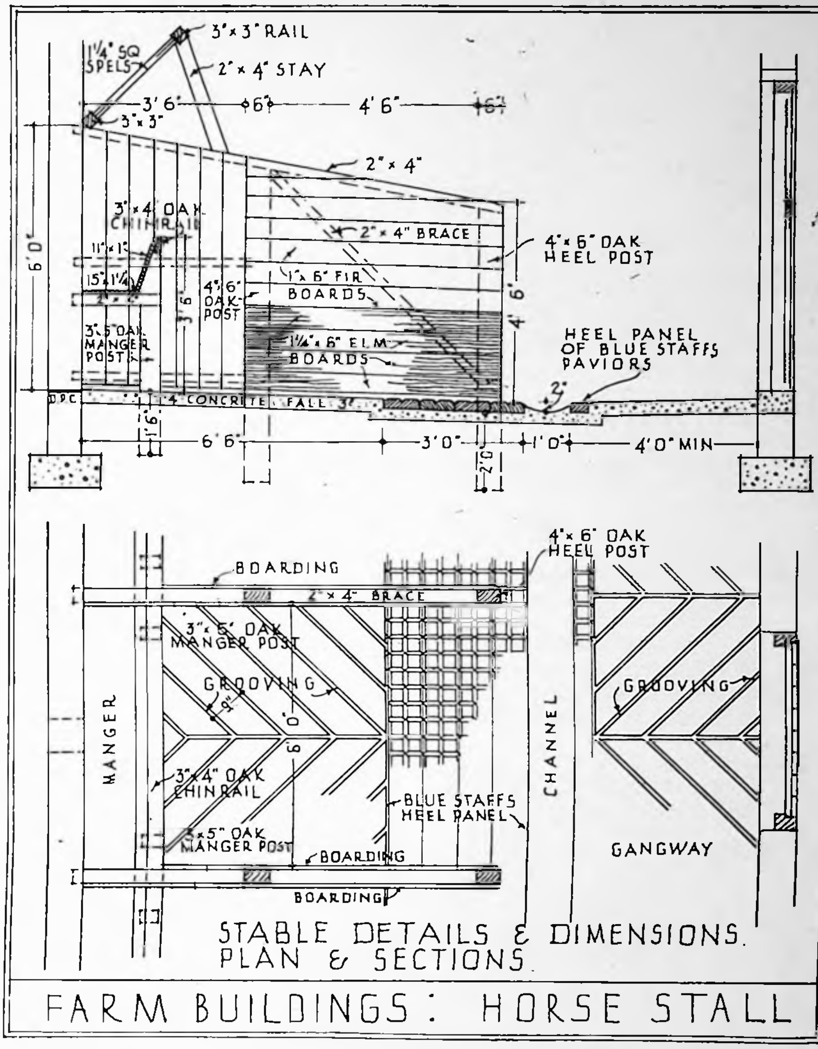


Figure 16

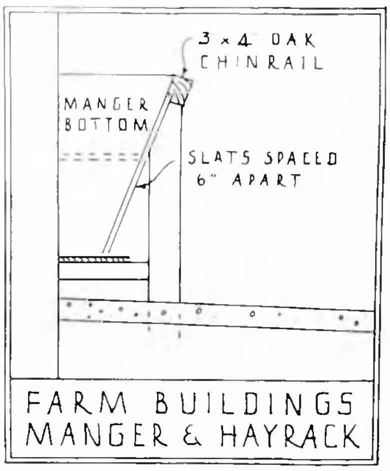


Figure 17

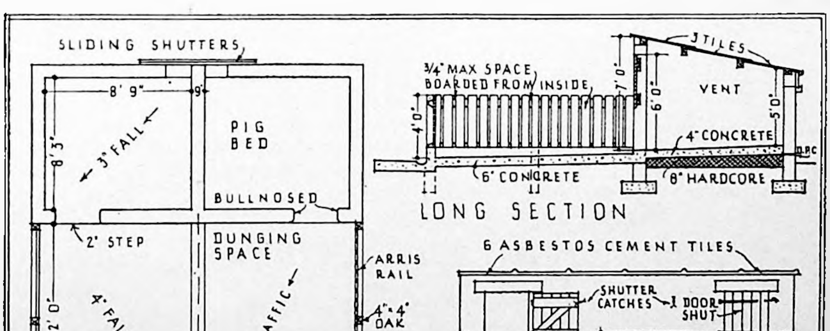


Figure 18

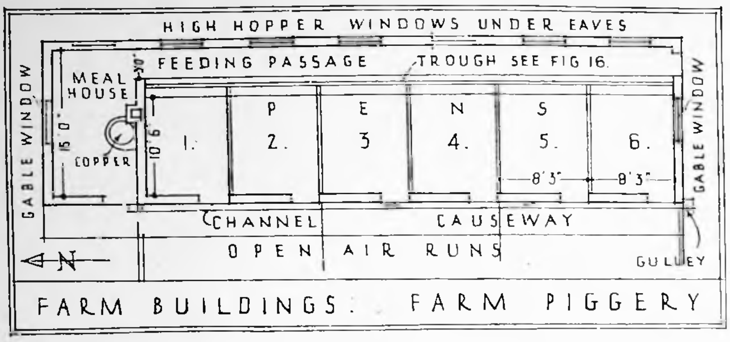


Figure 19

Throughout the house the arrangement embodies a central feeding passage and outer dunging passages. These latter communicate with the pens by openings one foot nine inches in width, closed by a door the full width of the passage when dunging-out is in progress, but open to the pen when the door is closed across the passage, thus dividing the pens from each other. These passages must be wide enough to allow pigs to turn; say, three feet nine inches for full-grown porkers. They serve also another purpose—as circulating ways for the weight-recording business by which pigs pass to and from the weighing pen.

British practice usually omits the loft and the heating stove (perhaps unwisely), and quite often restricts this type of equipment to the fattening house planned as on the left of Figure 21, providing for boar and farrowing by more ordinary means such as normal loose boxes or pens.

Construction—It may be noted that a house of the type shown in Figure 21 is of a width which would permit conversion to a normal double-range cowhouse, which, in view of the mutability of agricultural prospects, may be a useful precaution. Condensation of moisture and coldness of floor and wall surfaces are evils equally to be avoided as with cow-houses, and may be countered by similar means. Roofing, if of any thin non-absorbent covering, should be insulated, and the cheapest means is probably by a layer of rabbit wire covered with bituminous felt, fixed below the covering. Floors, if of concrete, which seems the best material for wear and sanitation, should be insulated from cold ground by internal

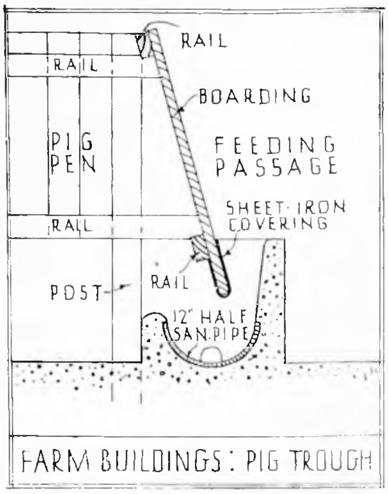


Figure 20

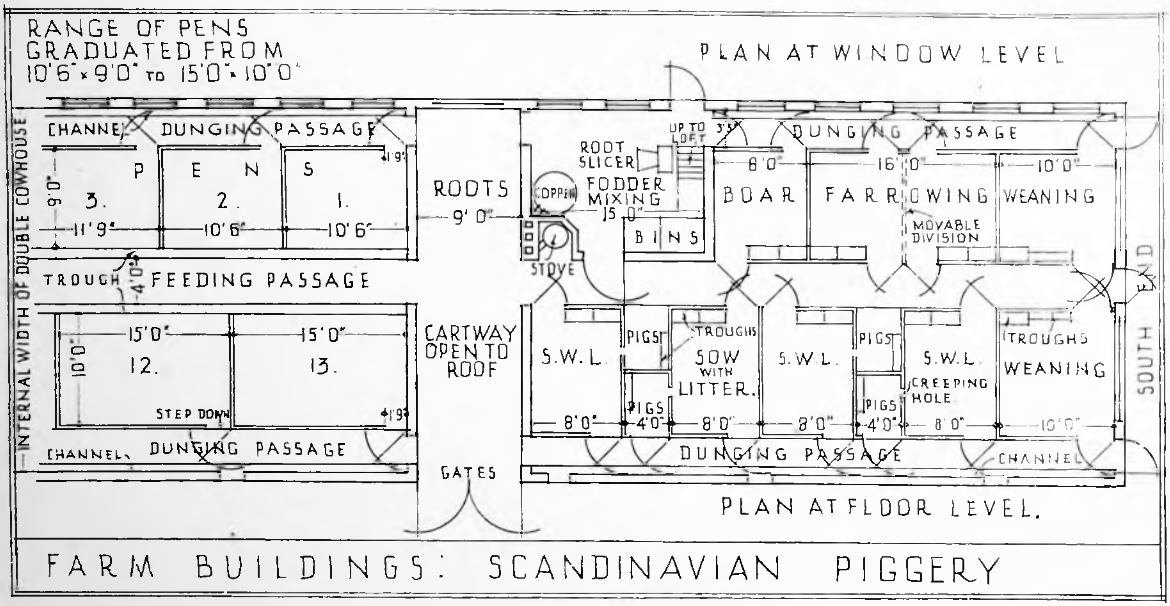


Figure 21

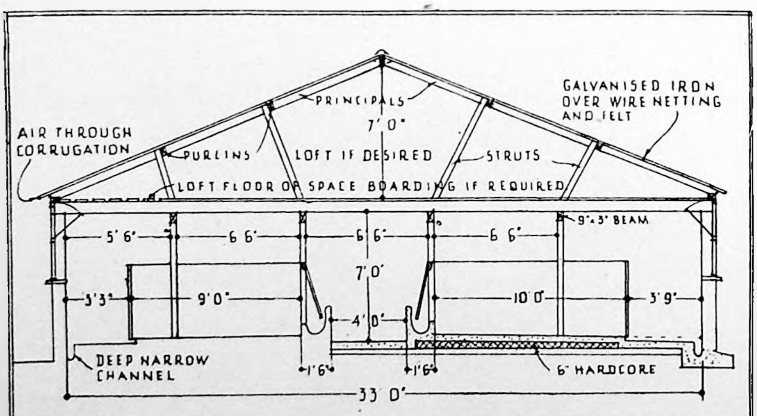


Figure 22

cavities or by mounting on a layer of 6 in or 8 in coarsely broken brick, stone or clinker—say 4 in of fine concrete on 6 in of hard core, as in the cross-section in Figure 22. In cases where it is decided to form a boarded loft, space-boarding allowing 1-in interval between the boards can be employed. This will sufficiently retain straw and other bedding material stored and used for insulation in winter and will permit freer ventilation in summer than would close-boarding.

Light and Ventilation—In the double-range piggery last described, if a loft is formed, lighting is restricted to the walls and virtually the whole length of the two long sides (which should face east and west) will need to be windowed. If no loft is formed, continuous roof-glazing or a series of skylights can be formed above the centre gangway.

Ventilation should be ample but controlled. Hopper lights in the upper part of windows, eaves and ridge ventilation in the roof, and air inlets near paving level along the side walls (so arranged as not to coincide with the openings from dunging passage to pens) are all desirable. The latter should be grated so as to exclude rats.

Drainage—Open channels alone should be allowed inside the buildings, with outlets to external gulleys, entering below the gulley gratings. The deep, narrow form of the drain channels in the dunging passages and their position against the walls is intended to prevent pigs from reaching any liquid therein, which in times of thirst they may be tempted to drink.

An arrangement which may be preferred to the narrow internal channel shown is the formation of an *external* channel running along the projecting concrete footing of each side-wall with outlets at relatively frequent intervals. The outlets, however, must be effectively baffled to avoid draughts and to exclude entry of vermin, by heavy metal flaps.

Drainage should be conducted to a liquid manure tank and not allowed to escape to any watercourse, for the dual reason that it is valuable as a fertiliser and noxious as a polluter of running water.

BUILDINGS FOR CROP-STORAGE

Farm crops may be roughly divided into those which are grown with the object of sale and those intended as fodder for livestock, though obviously the two classes shade into one another in such instances as hay or oats, and there is a third minor but important class—seeds.

Field Crops—A fenced stackyard, preferably metalled to stand wheeled traffic, is an essential to any farm which retains a proportion of arable. Its area must be proportioned to the average expectation of crop. In years producing an abnormal grain crop, such as 1938, this may prove inadequate and call for overflow, but as storage is brief and temporary, no serious detriment arises. The old method by which grain crops were stacked on a base raised on the familar stone mushroom-shaped staddles, and hand-thrashed in a capacious barn, has been ousted by the parallel method of stacking under permanent Dutch barns and thrashing mechanically, most often by a visiting engine and plant. Grain crops thus stay for much shorter times in stack, and in some cases are not stacked at all, but thrashed in the field by "combine harvesters." The Dutch barn has, however, the further object of sheltering the straw or hay crops, which are necessary to farm working either as bedding or fodder, and they have the advantage of giving *immediate* shelter, which may even include the last load each night without unloading, and saving the recurrent cost of thatching. Ugly as they are, they, therefore, form a desirable feature of farm equipment. Except for very minor examples, these are always the work of specialist firms, and made to a range of standard bay dimensions. The materials employed are steel and galvanised iron (or corrugated asbestos-cement), or creosoted timber, the latter being advisable in districts adjacent to industrial areas, where galvanising cannot be relied upon.

Points which should be remembered as affecting design and structure are:—

(1) Gales put a severe strain on the structure when the barns are *empty*, and the stanchions and bracing should be ample to withstand this.

(2) Some form of anchor for the stanchion feet in their concrete bases should be provided—either angle-iron cleats, bars threaded through the web, or other devices.

(3) The concrete bases should be brought up above ground level and weathered; often they are seen too low, forming pools around each stanchion.

(4) Any barn comprising more than one span in width must have a valley gutter of sufficient width for walking, and it must be well supported, otherwise blockage by dross and internal leakage is sometime inevitable.

(5) In exposed situations the wet aspects are preferably sheeted down either to ground level or to about 7 ft above it. The latter is sometimes an advantage, as it may permit a wagon to pass through after off-loading. The continental custom of gaining increased cover by a wide cantilevered roof spread beyond the line of stanchions does not seem to have caught on in this country (Figure 23). A range of Dutch barns in relation to other buildings is shown in Figure 4. Isolated hay barns on similar lines are often necessary in outlying grass fields.

Granaries need to be dry and protected against rats. These requirements, as well as the desirability of storage in bulk in such position that delivery either to transport vehicles or for consumption may take place with the minimum effort, suggest an upper storey or loft. In the design of a granary it should be remembered that wall space for bins is of importance. The plan of a granary will, therefore, best comprise maximum wall space, centre gangway, top light over the gangway (never over the bins, in case of leakage), a loophole door with cathead and hoist adjacent to a hard road, a trap with easy ladder (6 in riser and angle not over 60 deg maximum), and probably a hopper and chute to the mixing room below, if this relationship exists (Figure 24.)

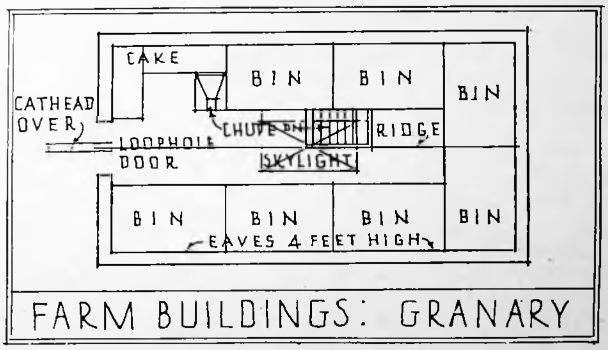


Figure 24

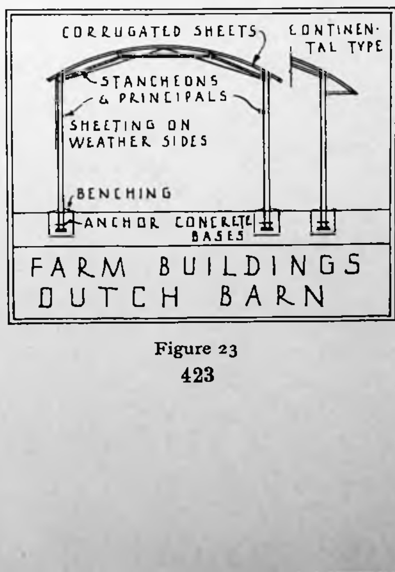


Figure 23

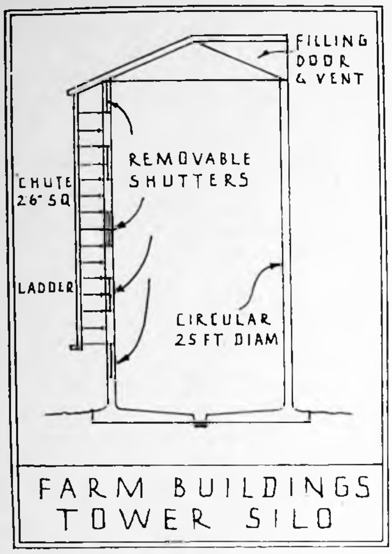


Figure 25

Cake-store—This is even more necessarily made proof against rats, and needs to have a stout floor. Grain in bins to a depth of 3 ft gives a loading of one and a half hundredweights per sq. ft., and oil-cake (which may be stacked higher) gives even heavier loading. A portion of the granary is usually set apart for storage of this important feeding stuff, which, of course, is not a crop but bought fodder, costly, and liable to exude oil, which would be detrimental to grain not intended for animal consumption.

Chaffhouse—Chaff, being chiefly fed to horses, is preferably stored near the stabling—often a walled loose box adjoining the carthorse stable is fitted with a pitch-hole door so that it may serve this double purpose. The requirements are :—

(1) Easy means of filling and withdrawing chaff.

(2) A sound roof and a dry floor.

(3) Stout walls or partitions capable of sustaining the pressure of a depth of 10 ft of chaff.

Filling is usually by a pitch-hole door about three feet square, as high as possible—say in a gable-end. Chaff is withdrawn for use by a slide or doorway at ground level. The need for dryness is due to the liability of chaff which gets moist to swell and heat up, when it becomes spoilt.

A Roothouse intended to store immediate supplies of swedes or mangolds, stored in bulk by clamps in the field, should have large double doors off a hard road, to which a cart or lorry can back. It should perhaps be added that it is by means of oil-cake and roots for winter consumption that modern dairying and stock-raising has been rendered possible.

Silage, which for the non-agricultural reader it may be necessary to explain is the name given to crops cut green and preserved for winter feed in an airtight container, requires special provision where its use is in contemplation. A silo takes the form of a hollow round tower covered by a roof, with some provision for top ventilation. It is fitted with a large door at the top, through which it is filled (usually by a blower from the chaffing machine) ; there are also a number of smaller doors arranged one above the other up one side of this for

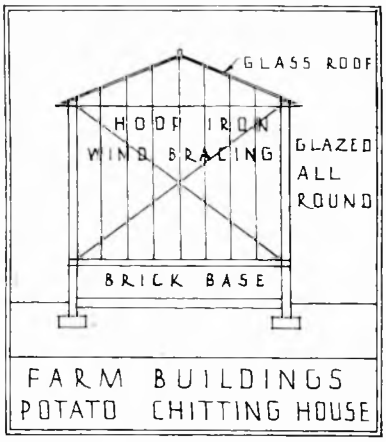


Figure 26

its extraction when required for feeding. This vertical range of doors, each with a loose shutter, is generally contained in a projecting shaft on the silo structure, which also contains a vertical ladder for access. Provision for drainage of liquid from the silo bottom is requisite (Figure 25.)

A silo must be able to withstand considerable bursting pressure, and the favourite methods of construction are (1) creosoted wooden staves bound by metal hoops ; (2) reinforced concrete ; (3) interlocking concrete blocks.

As some guide to size, a silo to provide winter feed (in lieu of roots) for a herd of 25 cows might be 15 ft diameter by 30 ft high, and would contain roughly 100 tons of silage ; a silo 12 ft diameter by 24 ft high, holding about 50 tons, would serve for a herd of 12 cows. The delivery chute from a silo should be in communication with the mixing-fodder place (see Figure 14).

Seeds, being relatively small in bulk, do not usually require special storage other than the granary, but an exception must be made for seed potatoes. In farming areas where this crop is a main industry a special form of glasshouse, known as a chitting house, is an essential. In this the seed potatoes are spread in trays piled in spaced tiers for the action of light to encourage shoots to form (Figure 26.)

A relatively new class of substance requiring provision for storage is the artificial manure or fertilizer now commonly employed. This must be a dry building and should have a specially hard and smooth concrete floor with sufficient free space for mixing. A wide central doorway should be provided capable of admitting a backed cart, and a few low brick open-fronted bins—say 3 ft high—are a convenience. A plan is given in Figure 27.

Fodder and Its Preparation—One of the greatest drawbacks and labour-wasters in old farm buildings is the distance which it is often necessary to walk in order to collect the necessities for a ration. In planning or remodelling equipment it should be the aim to follow a scheme somewhat akin to up-to-date factory design, by which raw materials in bulk are conveyed and stored adjacent to their place of assembly, which itself should be centrally placed for ease of distribution.

Items which are compact and heavy should preferably be stored

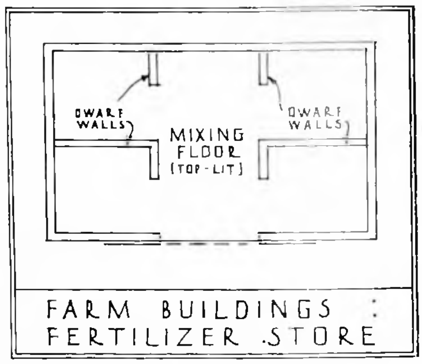


Figure 27

above their point of use ; grain and cake, for instance, in a loft directly over the mixing floor (see plan, Figure 4), hay close at hand in Dutch barns or in some districts in lofts over stock-pens, roots in a part of the mixing-house, and silos (if provided) in close connection.

The scale of provision will, of course, depend on the acreage and type of farm. Figure 4 gave an arrangement suitable in scale for an average farm of 100 acres or so ; Figure 28 shows the lesser provision suitable for a dairy holding up to 40 acres, while Figure 14 gave the plan of an outfit which might serve for some 200 acres, with possibility of extension to either of the three ranges of stock housing.

The Mixing Floor will usually have to accommodate a certain amount of machinery, the lay-out of which is important. The motive-power will usually be an electric motor or Diesel oil-engine, which most commonly must be so placed that it may fulfil several other objects—for example, pumping, driving an external sawbench by means of a spare pulley, and (if no public supply exists) generating lighting current. Dairy equipment may also be actuated. The strictly fodder-treating apparatus likely to be installed may consist of a kibbler or cake-crusher

root-slicer and chaff-cutter (Figure 29). Where dairying is carried out on an extensive scale, live steam is a necessity for sterilising, and in these circumstances it may be more practical to utilise steam-power for mechanical purposes as well. The steam-boiler, with provision for fuel, should be accommodated in a separate compartment as every type of dust (such as may arise from hay and chaff) is liable to produce an inflammable mixture. Fodder distribution on a large scale is much facilitated by the provision of slung tracks carrying special trolleys, which may also be extended so as to convey litter and dung. These require early consideration in planning; dotted lines in Figure 14 show such an installation, which, however, is somewhat expensive in first cost and only justifiable when by its inclusion it permits a definite reduction in employed men. Below that stage, the less costly provision of "loose-wheel" trolleys might more often be made—these require no structural provision other than an avoidance of steps higher than a few inches.

Shelter for Implements—The old-style cartshed and implement shelter was almost invariably sited to face north. This had a dual object; a sunny aspect is liable to occasion shrinkage of wooden wheels and wagon structures so that these tend to fall apart; also sunny aspects are valuable for livestock shelters. The north aspect is still the most suitable for wagons and carts, and shelters intended for these should have a minimum depth of 14 ft and a minimum opening between posts or pillars of 9 ft. In both cases greater depth up to 20 ft (which would cover a wagon with its shafts) and a width of opening up to the maximum possible is to be preferred. An unobstructed entry permits more economical use than any system of "bays," allowing such unwieldy objects as drills and reapers to be housed, and also permitting closer packing among the lesser implements. It must be realised that many essential farm implements have strictly seasonal use, so that their relegation to the rear of a deep shelter is not so inconvenient as may appear.

Where circumstances favour, a "pull-through" type of shed is a great convenience, but is apt to increase the necessary amount of hard road surface requisite for satisfactory working.

A farm workshop in which periodic servicing and minor repairs to implements and mechanical equipment can be performed, becomes almost a modern necessity. This should contain a bench with vice, bins and racks, and possibly a forge and anvil.

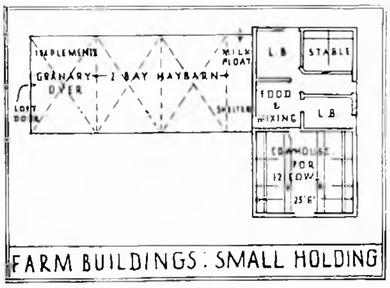


Figure 28

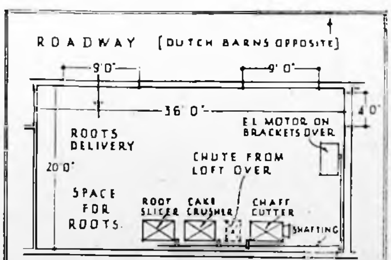


Figure 29

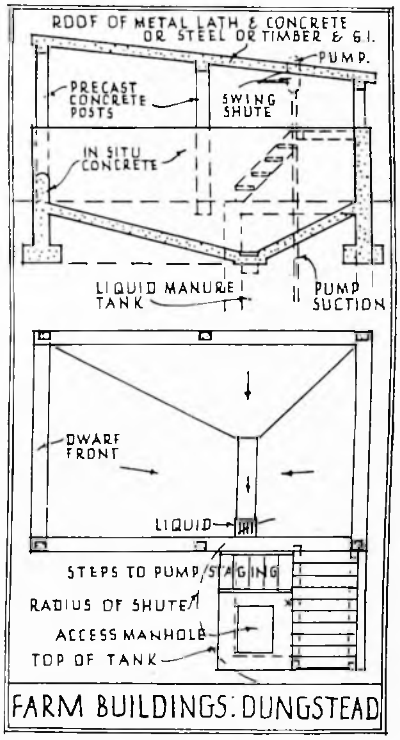


Figure 30

Tractor House—A garage for one or more farm tractors is a modern requisite on most arable farms, and storage of motor fuel is also needed. It is unwise to combine either of these with other farm buildings; they should stand detached.

Manure Pit or Dungstead—The untidy and wasteful manure heap should form no part of the modern farmstead. The fertilising value of manure requires conservation, which in the case of solids is best attained by a covered and water-retaining pit, while liquids should not be allowed to run to waste, but conserved either by incorporation with litter in yards as already described, or by collection by drains in a conveniently placed underground tank. The fertilising value of manure is said to be reduced by about one-third if it is left exposed to the weather. A convenient method of preservation is shown in Figure 30, suitable for a small farm. Points which must be considered are means of loading, ease of removal, and treatment during storage period. On the larger scale proper to a big farm, these can be solved as shown in Figure 31. Delivery is by carriers on a runway from the animal houses, or sometimes by a barrowing ramp. Removal is by the cart-ramp shown, and by way of treatment during maturing period, the liquid manure tank which receives farm drainage is so placed that by pumping the liquid and distributing it over the surface of the stored dung and litter from time to time, the proper degree of rottenness is attained. The liquid which drains from the manure in the pit also escapes to the tank adjoining

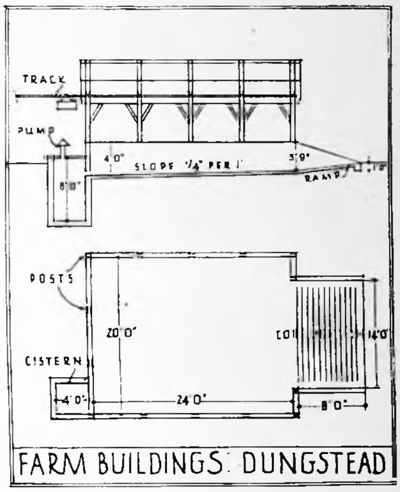


Figure 31

Sheep or Pig-dip—Vermin and diseases in lesser farm animals are countered by dipping in chemical solutions at certain seasons, an operation which requires a properly designed and constructed dipping tank. In the design of the tank shown in Figure 32 the following vital points should be noted. The entrance passage should be inclined, and the object of the turn is that the animal should not see where it is going. Next the tank is a steeper slope which will shoot the animal in, but not so sharply as to cause risk of injury. The tank must be narrow, to prevent the animal turning round, long enough to secure immersion for a minute or two, and deep enough to make it disappear on the first plunge, and to compel swimming. At the far end should be an easy slope roughened or cleated to give good foothold.

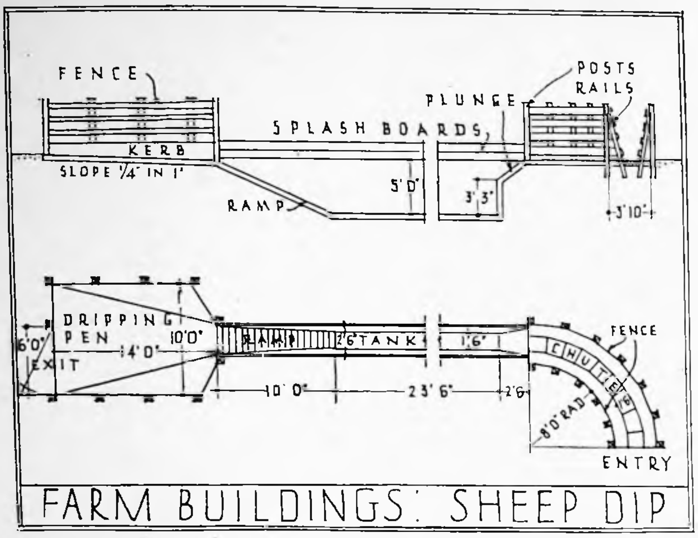


Figure 32

floor-hardener helps the life of paving—and should be ceiled and have wire-gauze fly protection to windows. There must be no internal drain inlets. Any racks for storage should be non-absorbent—stout galvanised tubing is the best material for everyday use. A room 10 ft by 8 ft suitably planned will suffice for cooling and despatch of milk from a herd of fifty milking cows—rather more space is requisite if bottling is to be done, and a bottle store is also desirable (Figure 36). Large establishments also include a cold store for bottled milk, which necessitates the further provision of space for a brine pump and compressor. In the plan that provision is shown above the fuel bunker, occupying the space below the roof gable. It should, of course, be separated from the boiler and fuel by dust-tight divisions.

The Washing-up and Sterilising Room should be approachable from the dairy and also from outside, as it will have to deal with equipment from both sources. It will contain usually a steam-chest for sterilising portable equipment, and this should be large enough to contain the cooler. Other

The dripping-pen shown is important to prevent loss of the dipping solution, which would be costly. The liquid drains back to the tank, and is not wasted. In connection with any dipping tank, arrangements of collecting pens at entry and exit are usually made by hurdles.

Pig Wallows—A less usual item of farm equipment is the pig wallow, but its provision in connection with pig-keeping on any considerable scale would usually be an economy. Pigs will wallow in mud if no better facility for keeping cool is afforded them ; the fresh water wallow allows them to be clean and comfortable ; it can be used on occasion for disinfection from vermin ; and it should be recognised that the comfortable pig "does" better in consequence. A wallow of the size shown in Figure 33 would serve twenty to thirty pigs. If a continuous flow of water from a spring can be arranged it is best. Drainage is by a standing waste and overflow.

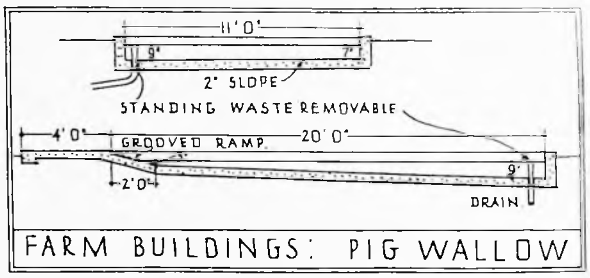


Figure 33

Dairy—A proper milk room is a necessary adjunct to any cowhouse from which milk is sold, whether it is cooled and sent away in bulk, or bottled and retailed. The room, with its ancillary accommodation, should be close to, but disconnected from, the cowhouse, and may be under the same roof (Figure 34) or detached (Figure 35). Milkers should not enter the milk room, but should pour the contents of their pails into a receiver (removable for sterilisation) delivering by a pipe through the wall to the cooler in the dairy. This entails a stepped platform to give the necessary height, and in connection with this a desk or bench for recording is useful. There should also be a glazed panel which will enable milkers to look into the dairy before pouring. Up-to-date practice includes hand-washing provision for milkers, and facilities for the keeping of clean overalls.

The Milk Room should be used for no other purpose than cooling and despatch of milk, and the storage of sterilised equipment for so doing. It should have an impervious floor and dado—trowelled cement is best, and a

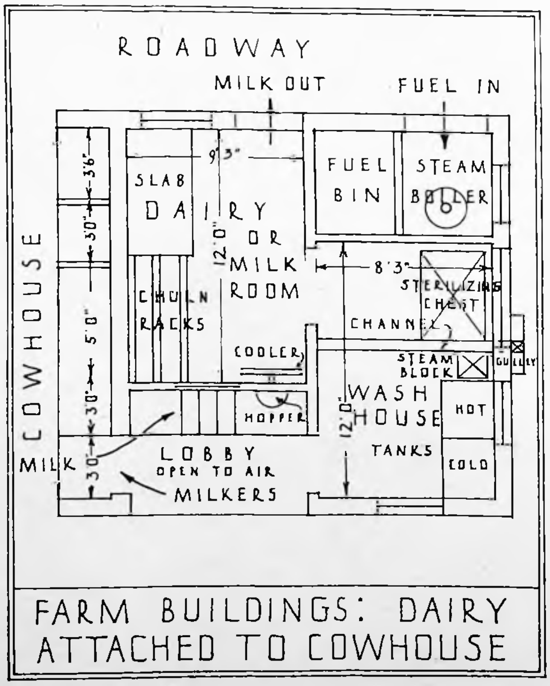


Figure 34

fittings are a steam-jet or block on which churns may be inverted, and tanks or troughs for washing and rinsing. Steam for sterilisation, and abundant hot and cold water are required, and where low-pressure steam is used hot water is usually obtained by blowing steam through a nozzle into cold water. A chest 4 ft by 3 ft by 4 ft will usually suffice to deal with equipment for a herd up to forty or fifty cows, and two tanks or a galvanised double trough 4 ft by 2 ft 3 in by 1 ft 6 in will allow the necessary washing to be performed; if bottling is done a rinser must be added, increasing the length by a further 2 ft or so. Usually this equipment is supplied by specialists. Stoneware or fireclay sinks are unsuitable, and fail to stand up to heavy use. The steam block is a pedestal about 6 in high, having a steam jet and two valves.

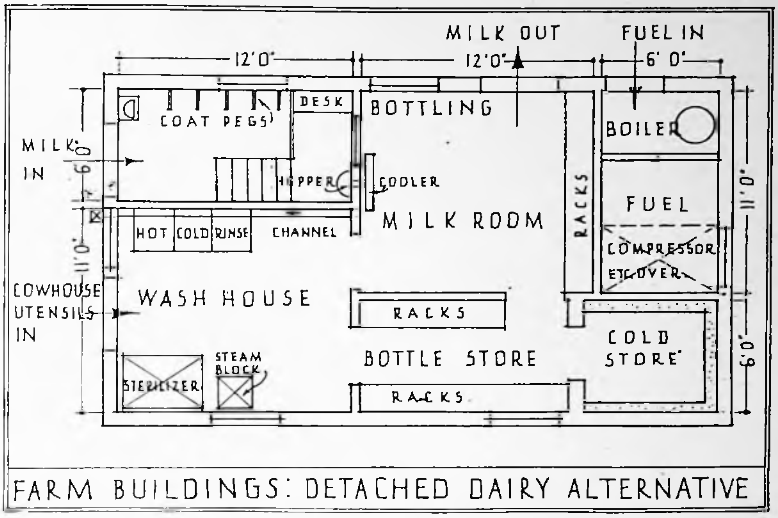


Figure 36

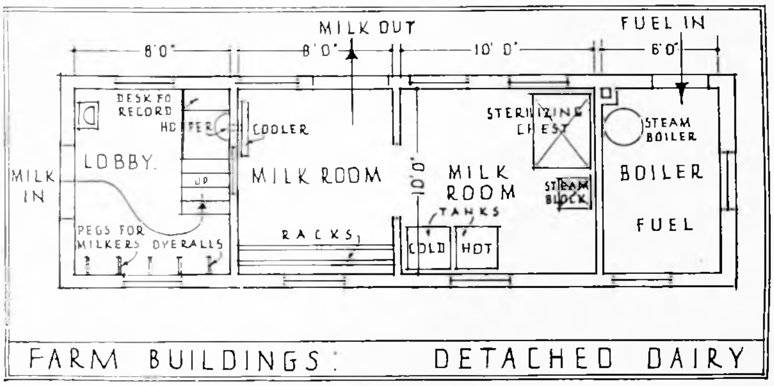


Figure 35

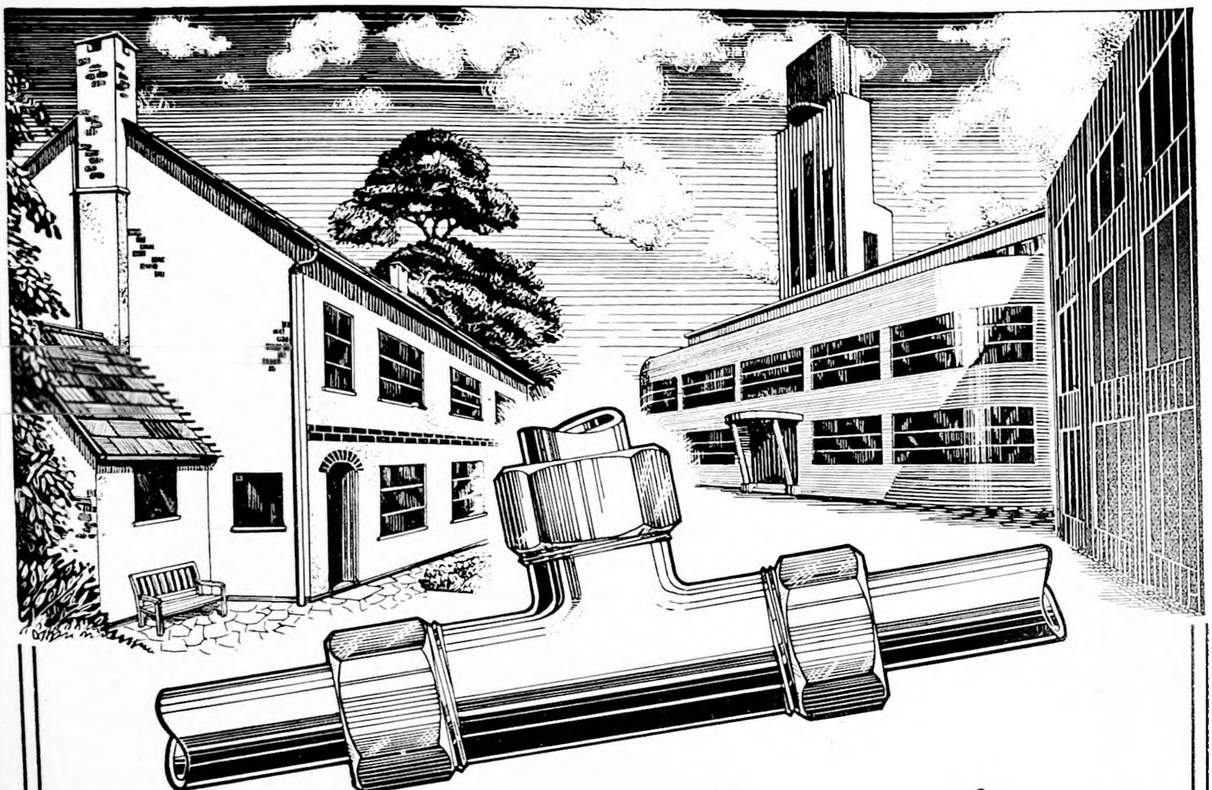
It is usually convenient in small and compact outfits to so arrange relation of boiler (in adjacent compartment) that apparatus requiring live steam stands adjacent, as shown in Figures 34 and 35.

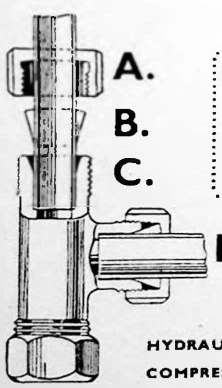
Economy in space is sometimes achieved by recessing the sterilising chest (which is apt to be somewhat obstructive in a confined area) so that only the front and door is in the wash-room, the chest itself projecting into the boiler-room at a height of 4 ft above the fuel bin.

Wooden troughs, shelving, or racks should be entirely excluded, and floor and wall finish may be similar to the dairy. Top ventilation is desirable for escape of steam.

In larger establishments duplication rather than increased size of apparatus is preferable.

The Boiler Room and Fuel Store may also serve usefully as a drying room for the outdoor clothes and boots of workers. Vertical steam boilers of $1\frac{1}{2}$ to 2 h.p., suitable for dairy purposes are supplied by specialists. Oil-fired types are available, and, for general cleanliness, particularly where electric generators must be housed in the same compartment, offer advantage. Good artificial lighting is (or should be) an important factor in convenience of cowhouse and dairy equipment, much of the work through several months of the year being necessarily done during hours of darkness.





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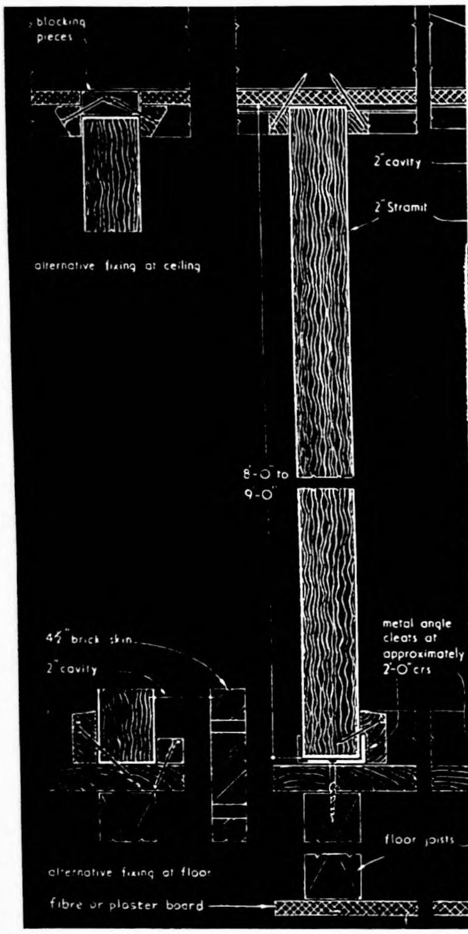
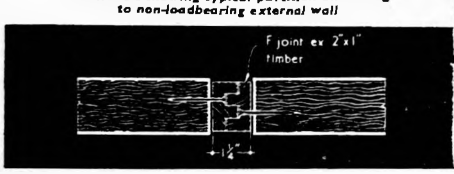
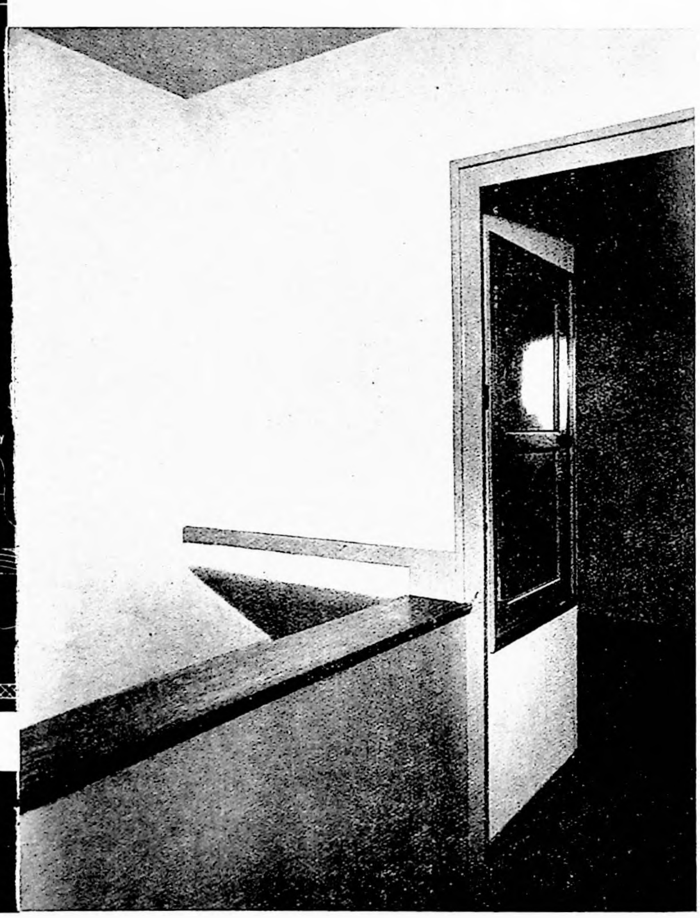


Section of one of our information sheets for architects showing typical partition and lining to non-loadbearing external wall





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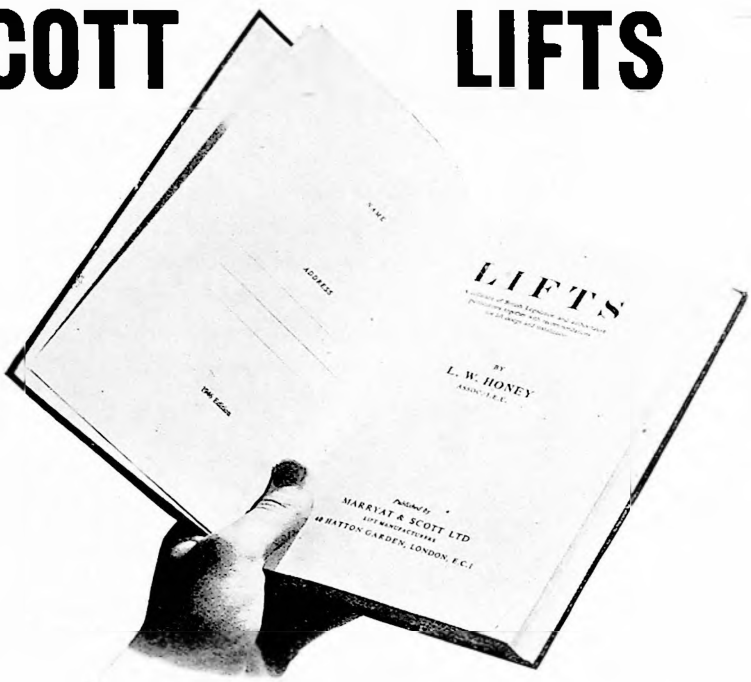

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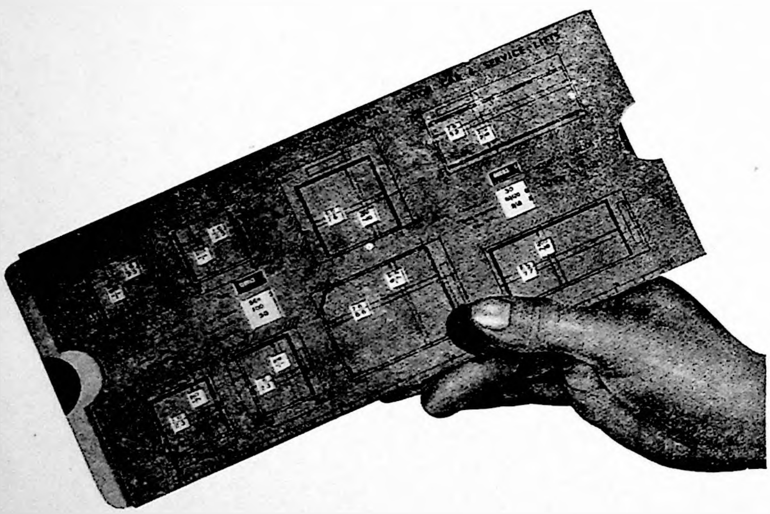

The Architects Calculating Rule first published in 1936 for the use of architects has been reprinted. It contains for speedy reference all the necessary preliminary information for the planning of Passenger, Goods, Hospital, Motor Car and Service Lifts, and is extremely useful for sketch plans where only essential facts are required without detail.

These two aids to planning are available free on request, to practising architects from any of our addresses below

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